

PROCEEDINGS

OF THE

ROYAL SOCIETY OF MEDICINE

EDITED BY
SIR JOHN Y. W. MACALISTER
UNDER THE DIRECTION OF
THE EDITORIAL COMMITTEE

VOLUME THE FIFTEENTH
SESSION 1921-22

PARTS I & II
GENERAL REPORTS

SECTIONS:—

ANÆSTHETICS	BALNEOLOGY AND CLIMATOLOGY
STUDY OF DISEASE IN CHILDREN	CLINICAL DERMATOLOGY
ELECTRO-THERAPEUTICS	EPIDEMIOLOGY AND STATE MEDICINE
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The Royal Society of Medicine.

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OCCASIONAL LECTURE.

Syphilis of the Stomach.

By GUSTAVE MONOD, M.D.Paris, M.R.C.P.Lond.

(Physician, the Vichy Thermal Hospital.)

THE importance of this question of syphilis of the stomach is undeniable. If syphilis of the stomach is to be formally recognized, then a correct diagnosis may save a patient's life, and there can be no greater satisfaction than to see a rational and methodical plan of treatment effect, as a result of correct diagnosis, a complete cure in a patient suffering from grave and chronic disorder of the digestive system.

The history of syphilis of the stomach falls naturally into two great periods: (a) that from 1834-1907—from Andral to Pater—when the clinical and pathological facts were first marshalled; and (b) that since 1907, during which time modern methods of research have thrown new light upon the subject.

The first indisputable case on record is then that narrated by Andral, ("Cliniques," ii, p. 201, Paris, 1834). A young woman, aged 27, not evidently syphilitic, had been suffering during two years from vomiting, epigastric pain, loss of appetite, and wasting. The stools were normal. The diagnosis was *chronic gastritis*. In spite of treatment the patient became steadily worse, and the vomiting was almost incessant. Sore throat developing, however, ulceration of the fauces of a certain character was observed, and Andral, suspecting syphilis, initiated treatment by mercurial pills. At the end of a fortnight there was some improvement; at the end of a month vomiting had ceased. Mercurial inunctions were then ordered, and after twelve "treatments" the patient's condition completely changed. The pain, as well as the vomiting, ceased, and a perfect cure was established.

Later, Andral reported a second case, no less significant, but, following him, little attention was paid to the subject until various clinicians—Dieulafoy, Fournier and Hayem—and pathologists—Cornil, Chiari and others—took the matter up (*vide* Pater).

In 1907 Pater, in his well-known thesis, systematized the scattered available knowledge, and discussed some 122 recorded cases, rejecting as non-syphilitic or unproven all those in which there was no corroborative microscopic evidence, but accepting others. With the appearance then of Pater's thesis it may be said that syphilis of the stomach was definitely established as a real, though rare, affection.

Since 1907 many fresh contributions to our knowledge of syphilis of the stomach have been made by French, by American, and by German observers, who have employed radioscopy, who have made use of the Wassermann

reaction, who have administered salvarsan and other specific remedies, and who have searched for and found the *Spironema pallidum*. Amongst these we may mention the French authors Leven, Bensaude, Enriquez, Florand and Lion; Haas (in Germany) and Clark, Smithies and Eusterman in the United States of America.

In spite of much work, however, no reliable *statistical* information can be given. Not every physician or pathologist is alive to the importance of thinking of syphilis of the stomach, and opinions still differ as to the validity of the pathological and therapeutic *criteria*. But it may be said that, while Smithies only finds 0.34 per cent. of 7,545 cases of dyspepsia to have been due to syphilis, in France the accepted percentage is somewhat higher, although no absolutely reliable figures can be given (*vide* Lacapère, *La Presse Médicale*, July 3, 1919).

If now we seek to summarize what has so far been ascertained, we may say that, from the point of view of the morbid anatomist, either at autopsy nothing special is observed in the stomach, or else there is (1) a cirrhotic condition, or (2) a gummatous condition.

As Dr. McNee will shortly demonstrate to you a most remarkable specimen of chronic gastric ulcer, due to syphilis, and showing the spironemas as well as syphilitic endo- and peri-arteritis and a general fibrosis of the submucous tissue, I will say nothing further than this, that small, round-celled infiltration of the submucous tissue is very common in these cases and may, obviously, lead to the development in time of the "leather-bottle" stomach.

Clinically it must be said that, in secondary syphilis, dyspepsia and bulimia have been described as correlated with the infection, while Bensaude mentions the possibility of the early formation of a syphilitic ulcer, and at least one case of hæmatemesis, with severe pain during the fourth month of the disease, is on record. In the tertiary stage the possibilities are wider. In France a "forme névralgique" has been described, and is explained as a neuralgia of the solar plexus comparable to the recognized trigeminal, occipital and sciatic "neuralgias" of syphilis. The clinical picture of this form is that of hyperchlorhydria, associated with nocturnal pain. It is not amenable to dieting nor to ordinary treatment, but is cured by specific medication. In cases of this nature hæmatemesis is rare but melæna is frequent. Definite gastritis may, however, be a consequence of injudicious (specific) treatment which will also set up gingivitis and oral sepsis, entailing, in turn, septic gastritis and even ulceration. Thus, in practice, we meet with every form in transition from syphilitic "neuralgia" of the stomach to syphilitic ulceration.

The ulcerative type of syphilis of the stomach cannot, as yet, be perfectly defined, yet we may say that syphilis does more than merely exacerbate an ulcer; it may "create" one. According to S. Fenwick, 5 per cent. of gastric ulcers are syphilitic, but Engel says 10 per cent. and Lang 20 per cent.,¹ while other authors put the figure even higher. Castaigne, however, in forty cases of gastric ulcer seen in French soldiers, found the Wassermann reaction positive in eight, and produced a cure by specific treatment in four. A 10 per cent. ratio is, therefore, perhaps to be admitted.

In the ulcerative type the pain—*douleur en broche*—is subject to nocturnal exacerbation, but ordinary gastrorrhagia and vomiting are common. A typical case was described by Fournier, in 1867, when he said, speaking of a young woman with intractable hæmatemesis and a pronounced secondary syphilide :—

¹ Ewald, "Lectures on Diseases of the Digestive Organs" (New Sydenham Society), ii, 1892, p. 459.

L'inspiration me vint de faire appel de nouveau au traitement qui lui avait si bien réussi jadis. Je prescrivis l'iodure de potassium. Ce qu'il advint tient littéralement du prodige. Sans exagérer, ce fut un coup de théâtre, un changement à vue, une quasi-résurrection, car cette moribonde fut immédiatement soulagée et revint à la vie."

Several years later the patient suffered from a return of her gastrorrhagia. Medical men who saw her refused to give her iodide of potassium, but her life was again saved by Fournier's administration of that drug.

A syphilitic ulcer may be, of course, due to a breaking-down gumma, but is sometimes the result of an endarteritis, leading to local necrosis, and sometimes, perhaps, of trophic changes induced by syphilis of the posterior root ganglion—"herpes of the stomach."

The possibility of surgical (neurological) intervention may one day have to be considered in such trophic cases, but as a rule syphilitic ulcer is rapidly relieved by treatment, though, as in Fournier's case, relapse does occur.

Again, however, syphilitic ulcer of the stomach may end in carcinoma, just as does leucoplakia. A case of Lion's, in which specific treatment dissociated the symptoms of ulcer from those of cancer, may be mentioned (Lion: *Arch. des mal. de l'app. digestif*, 1919, x, No. 2).

The "pseudo-carcinoma" type of syphilis of the stomach deserves some consideration. Fournier (*Journal de la Syphilis*, 1903) recorded one case in which a pyloric tumour rapidly disappeared under specific treatment given as soon as it was remembered that the patient had had syphilis twenty years before, and Hayem (*La Presse Médicale*, February 18, 1905), narrated a case of a man operated on for a pyloric stenosis diagnosed as carcinomatous. On examination, the removed portions showed diffuse syphilitic infiltration, and, under specific treatment, perfect health was secured.

Mathieu (*Gaz. des Hôp.*, July 20, 1911, p. 1233) has, however, recorded a case in which specific treatment failed to relieve pyloric syphilitic stenosis developing in connexion with an enormous and gummatous liver.

Florand (*La Presse Médicale*, October, 1921) has recently described a case of "adenoma" of the left lobe of the liver partially surrounding and embarrassing the pylorus, treated surgically by gastro-jejunostomy and medically for syphilis. As a result there was complete recovery.

Perhaps in this case examination by X-rays would have assisted in earlier arrival at the correct diagnosis. Lemierre and Raulot-Lapointe (*Gaz. des Hôp.*, March, 1921) describe a case of hæmatemesis in which a syphilitic lesion of the stomach was diagnosed by them on the screen. The Wassermann reaction was positive, and specific treatment was successful. In this case there was an hour-glass stomach, and a round movable tumour (independent both of the pylorus and the lesser curvature), which was the obvious excitant of the spasm.

Medio-gastric stenosis (hour-glass stomach) due to syphilis, was first studied by Leven and Barret (*Soc. de Radiologie Médicale de Paris*, January, October, November, 1910; *Bull. et Mém. Soc. Méd. des Hôp. de Paris*, February 25, 1910), p. 149. Another case has been recorded by Bécclère and Bensaude (*Bull. et Mém. Soc. Méd. des Hôp. de Paris*, May 19, 1911, p. 680).

Only one case, however, of stenosis of the cardia due to syphilis is known to me (Enriquez and Bensaude, *La Presse Médicale*, October, 1919), and this case, it is interesting to observe, later developed into the type which will be the last I shall mention, the *linitis* or "leather-bottle" type, described by Leven in "La Dyspepsie" [(Doin) Paris, 1922], under the title of "Le petit estomac syphilitique."

In *locomotor ataxy* the gastric crises are doubtless generally nervous in origin, but, if Castaigne's views are well founded, they may sometimes be truly gastric. Castaigne believes that, just as a syphilitic joint becomes the subject of an arthropathy of nervous (trophic) origin, so may a syphilitic lesion of the stomach provoke gastric crises. But, in any case, we must not forget the possibility that some of the "neuralgic" cases, if not the "herpetic," may represent, so to speak, *tabes*, confined to one or two spinal segments only, depending on syphilitic "radiculitis" of limited distribution.

In congenital syphilis, the same forms of stomach affection have been described as those which I have mentioned. But some have gone so far as to ascribe great importance, if not the greatest importance, to congenital syphilis in the production of gastric ulcer. Pater has described the post-mortem appearances in the stomachs of some infants, congenitally syphilitic, and Chiari and Oberndorfer have described gummatous ulceration.

Finally, while it is probable at least that gastric hæmorrhages in newly born syphilitic infants are due to such lesions as those described by Pater, it must also be said that possible cyclical vomiting (Marfan, "*Maladie de vomissements habituels*") without acetonuria, and in spells lasting from three to five days, may also be due to inherited syphilis.

From the point of view of *diagnosis*, it must be admitted that there is no pathognomonic sign or symptom of syphilis of the stomach. The syphilitic causal element or factor in a gastric ailment will only be recognized if the mind is always on the alert. In former days dependence was placed upon the *therapeutic* test; but this in itself is unreliable. Syphilis may undergo spontaneous "cure," or may be refractory to specific treatment. Chemical analysis, cytological examinations, and the Wassermann reaction are all helpful, but their results are not infallible. Definite proof of the syphilitic nature of a lesion is, of course, afforded by the finding of the spirochæte; and, certainly X-rays may be of very great assistance in cases which are clinically anomalous.

None of the modern methods of treatment has shown, in this matter of syphilis of the stomach, any decisive superiority over the older plans of treatment. Indeed, it is wonderful how well iodide of potassium is tolerated by the patients, and how effective it is. The very tolerance of iodide, in a doubtful case, seems to me of diagnostic importance.

Lastly: If, as we trust, Vernes' new method of examination—"syphilométrie"—allows us to form a reliable estimate, *quantitatively*, of the degree of syphilitic infection in any case, we shall have at our command not only a new method of *diagnostic importance*, but a means of *therapeutic control*.

SUMMARY.

(1) No part of the alimentary canal is immune to syphilis, and the stomach may be the site of definitely syphilitic lesions.

(2) Cases of syphilis of the stomach are now being reported, almost from day to day. But statistical information is not yet reliable, owing to the difference of opinion that exists as to the conditions of proof.

(3) Syphilis of the stomach is met with as a gastropathy of nervous origin, as ulcer, as pseudo-carcinoma, as stenosis, and as linitis.

(4) In congenital syphilis, gastrotaxis of the newly born and cyclic vomiting are met with.

(5) The best guide to the clinician in respect of syphilis of the stomach is found in the discrepancy that exists, in true cases, between the clinical and the technical (radioscopic, pathological, &c.) findings.

(6) One fact is placed beyond dispute; dyspepsias, otherwise incurable, are often cured by antisyphilitic treatment.

NOTE BY F. G. CROOKSHANK, M.D.

Dr. Monod has asked me to add a few remarks, by way of exegesis, to his paper.

It must be remembered that, in England, we are nowadays accustomed to resume clinical and pathological phenomena only in terms of *diseases*. By a disease, we mean a special symptom-group associated with special pathological changes and boasting a special ætiology, known or unknown.

Hence, when we speak, or think, of syphilis of the stomach we necessarily imply the association of (1) syphilitic infection, (2) a gastric syndrome and (3) a specific (syphilitic) lesion of the stomach. We refuse to admit the diagnosis as justifiable unless both (1) and (3) are joined with (2). But, in France, the phenomena of disordered health are not always expressed in terms of specific "diseases," as just defined, although it was in France that the modern doctrine of specificity arose, in consequence of the work of Bretonneau and others. So, by French physicians then, clinical phenomena are sometimes still interpreted in terms of *diatheses*, or *dyscrasias*. It will be, for example, postulated or implied, that the recovery, under antisyphilitic remedies, of a patient once infected by syphilis, and lately the subject of a gastric syndrome, is the result of treatment of his dyscrasia. But it will not necessarily be implied that a truly specific lesion was ever present in his stomach. In this way, recognition is given to what does happen clinically but which, in this country, is often pushed out of sight because it does not square with our dogma of the necessity for the expression of the whole range of clinical experience in terms of "diseases" and "specific lesions."

In the last two years, the writer has seen and treated three men (aged from 25 to 35) in the second and third years of treated syphilis, but with the Wassermann reaction positive. Each of these men suffered a violent hæmatemesis after a week or two of severe pain; in each the diagnosis of gastric ulcer had been made; and each case cleared up with extraordinary rapidity on the early administration of mercury and iodide of potassium by mouth. It is not necessarily to be supposed that any ulcer present in any of these men was syphilitic *per se*: but each patient was treated for his syphilitic *dyscrasia*, and got well.

At any rate, the difference in the points of view of the French and British schools of medicine must be remembered when we discuss such a paper as that of Dr. Monod.

BIBLIOGRAPHY.

PATER, "Syphilis de l'estomac," Thèse de Paris, 1907 (with bibliography). CURZENNE, "Syphilis de l'estomac," Thèse de Paris, 1920 (with bibliography). BARTHÉLEMY, "Manifestations gastriques de la Syphilis," *Gaz. des Hôp.*, 1921, p. 1066 (with bibliography). CARMAN and MILLER, "Radiographic Diagnosis of Gastric and Intestinal Diseases," N.Y., 1920 (with bibliography). SOLTAU FENWICK, *Lancet*, 1899, ii, p. 410. WOOD, *Lancet*, 1899, ii, p. 857. McDONAGH, "Venereal Diseases," 1920, p. 88.

DISCUSSION.

Dr. J. W. MCNEE said he was unable to discuss the subject from the clinical aspect, because the only case he had seen of syphilis of the stomach was the one from which the specimen and microscopic sections were now on exhibition in the room. Still, there were certain points in connexion with this case which were of much interest both

to the clinician and pathologist. The patient was a man, aged 57, who came into University College Hospital under the care of Dr. Sidney Martin, complaining of pain in the chest and abdomen of six months' duration. A diagnosis of probable carcinoma of the stomach was made during life for various reasons: first, because an indefinite mass was palpable in the epigastrium, and secondly, because, on examination of the stomach contents, free hydrochloric acid was absent, while lactic acid was present. Sudden perforation occurred, but no operation was attempted because of the probable diagnosis. Death supervened rapidly from general peritonitis. When the stomach was examined post mortem, the condition certainly closely resembled a scirrhus carcinoma, as all who had looked at the specimen exhibited would agree. There was a large area of ulceration, covering three-fifths of the wall of the stomach, and presenting certain peculiar characters. The stomach wall was in many places fully $\frac{3}{4}$ in. in thickness, in relation to the ulcerated area, and in section had also the pearly-white appearance often so characteristic of scirrhus carcinoma. But certain suspicious features were noticed. No secondary cancerous growths were present in the liver or other neighbouring organs, while the lymphatic glands behind the ulcer were small and obviously free from tumour growth. Even then he had no idea that the condition might be syphilis. On examining the ulcer histologically however (microscopic and lantern slides were shown), the frequency of endarteritis obliterans of small arteries, and the extensive round-celled infiltration along small blood-vessels suggested to him the possibility of syphilis. This was further suggested by the peculiar and unusual characters of the tissue forming the floor of the ulcer, which had the structure of a granuloma. Eight blocks of tissue from various parts of the ulcer were stained by Levaditi's silver method, and in one of these very abundant spirochetes were found. This block of tissue was taken from an area in which the ulceration appeared from its colour to be more acute than elsewhere. Dr. McNee said that the diagnosis of syphilis rested, of course, on the morphology of the spirochetes, which had been recognized as typical enough by all to whom the slides had been shown. No Wassermann test had been carried out during life, since there had been no suspicion of syphilis. He had recently examined other specimens of chronic gastric ulcer, where obvious syphilitic lesions were present elsewhere in the body. One of these was a typical case of *hepar lobatum*, with a large chronic gastric ulcer close to, and adherent to, the liver. In this case the histological changes did not in any way resemble syphilis, and no spirochetes were found by Levaditi's method. He said that the lesion in the specimen exhibited was certainly of a gummatous nature, but more acute than usually met with, and showing a very actively growing granulation tissue. He believed that the specimen was probably unique from the fact that the diagnosis of syphilis was based on the discovery of spirochetes in the depths of the granuloma forming the base of the ulcer.

Mr. A. J. WALTON said that the frequency of syphilis of the stomach had been much discussed. At the one extreme Castex and Mathis [2] held the view that every case of gastric ulcer was due to either acquired or congenital syphilis. The more usual view was that this ætiological factor was only present in a small number of cases. His own experience was based entirely upon surgical lesions of the stomach, and therefore no note would be made of the possibility of acute erosions or miliary gummata which might occur in association with congenital lesions or as a part of the febrile state of a secondary syphilis. The somewhat extensive literature had laid stress upon the fact that syphilitic lesions might be localized or diffuse, and thus might resemble peptic ulceration on the one hand or carcinoma or linitis plastica on the other. The simplest method would therefore be to consider what numbers of his cases could possibly have been due to this ætiological factor. His experience of surgical gastric disease comprised 264 examples of chronic gastric ulcer, 125 of duodenal ulcer, 125 of gastric carcinoma, one of sarcoma and one leather-bottle stomach. All of these cases had been operated upon, and whenever a portion had been removed microscopical examinations had been made. A Wassermann reaction had not been carried out as a routine procedure, as the importance of such a step had not been recognized unless there was some evidence in the history or symptoms of the patient to warrant such a diagnosis.

Leather-bottle Stomach.—In 1912, Meyers [8] had suggested that linitis plastica or

leather-bottle stomach might be caused by syphilis, a view which had been supported by Smithies [12] in 1915 and Symmers [13] in 1916. Lyle [9], however, in his masterly review of the etiology of this condition, although recognizing a carcinomatous and simple type, stated dogmatically that syphilis was not a factor. In his (Mr. Walton's) own series of cases there had been only one of linitis plastica, which was too extensive for gastrectomy. Death had followed a jejunostomy, and post-mortem examination with microscopical investigation had revealed the presence of carcinoma. The investigations of the London Hospital Pathological Institute were, however, of considerable interest. Professor Turnbull informed him that every case, some twenty in number, that had appeared there had been carefully investigated, and in every one the presence of carcinoma had been proved by the recognition of characteristic areas of growth either in the stomach wall or in the lymphatic glands. In many cases, however, an examination of a large number of sections had been required before areas of growth could be discovered. Their experience therefore at the London Hospital was that all cases so far had been carcinomatous, and that there had been no evidence of either a simple fibrous linitis or of a syphilitic variety.

Carcinoma of the Stomach.—In 1910, Bird [1] had laid stress upon the close resemblance of syphilis to carcinoma of the stomach. The syphilitic lesion might produce a well-defined tumour very like an early cancer. Bird mentioned a case in which a partial gastrectomy had been performed, and the specimen was found to be syphilitic. In a second case a portion had been removed for microscopical section and the diagnosis proved. The patient had improved with antisymphilitic treatment. Bird believed that a correct diagnosis was to be suspected if the tumour was succulent looking and almost opalescent, and if the omentum and peritoneum showed white unexplained scars. Meyers [8] and Fowler [7] had also emphasized the importance of recognizing a variety which might simulate carcinoma. All surgeons had had experience of cases of apparent carcinoma, which at operation had been too advanced for gastrectomy, and a gastro-enterostomy had been performed or even no operation done. A bad prognosis was given, but to the surprise of the surgeon the patient made good progress, and might not only live for many years but might be completely cured of the gastric symptoms. He (Mr. Walton) had met with three cases in which a previous operation had been performed by other surgeons, and the patients had recovered and lived for ten to fifteen years. As he had not performed the primary operation, the exact characters of the primary lesions were not known, but there was no evidence to exclude the diagnosis of a simple peptic ulcer. The symptoms of this variety were said closely to resemble those of carcinoma. Bird [1] stated that early carcinoma gave rise to slight symptoms while syphilis caused marked deterioration of health, but later in the same paper he stated that the previous history hardly gave an earnest of the clinical individuality. Downes [3] laid stress upon the unusual nature of the symptoms. While the pain was constant and not periodic, it was not influenced by taking food and was often worse at night. It was influenced but little by dieting and by medical gastric treatment. Downes believed that the two important points were the positive past history and the unusual symptoms. In all of his eight cases the X-rays had shown marked gastric deformity. This would frequently occur as a long and irregular narrowing of the pyloric canal simulating carcinoma, or of an hour-glass constriction more closely resembling that due to a chronic gastric ulcer. In his own series of 125 cases of carcinoma a careful microscopic examination had been made in every case in which a partial gastrectomy was performed. In all of these the presence of growth had been evident. Occasionally an ulcer had been treated by this method in the belief that it was carcinomatous, but the examination had revealed only the presence of a characteristic peptic ulcer. He had had two cases of tumour of the rectum which were regarded as inoperable carcinoma, and a colostomy had been performed, followed later by complete disappearance of the tumour, this suggesting that it might have been gummatous. In those cases, however, of carcinoma of the stomach in which a gastrectomy had not been possible, there had been no evidence of unexpected recovery. The majority had been carefully followed up and steady progress of the disease to a fatal termination had been witnessed. It was of course possible that some of these might have been syphilitic but there had been no other manifestations of the disease, and as a rule

secondary growths had been manifest. Apart then from this very unlikely possibility there had been no evidence of syphilis in a series of 125 cases of carcinoma of the stomach.

Chronic Gastric Ulcer.—The majority of cases reported as syphilis of the stomach had resembled either clinically or at operation chronic gastric ulcers and it was specially in this variety that such different figures had been given as to the frequency of the disease. Castex and Mathis [2] believed that all cases of gastric ulcer were due to congenital or acquired syphilis, but the wide knowledge which had been acquired of the pathology and symptomatology of gastric ulcer made such a view untenable. Ewald, according to Morgan [10], had found evidence that 10 per cent. of peptic ulcers were due to such an infection. The evidence in favour of so great a frequency was however quite insufficient nor did it even support Morgan's view that 1 per cent. of ulcers were syphilitic. It was of interest to note that Smithies' figures of 0·3 per cent. [12]—he had found twenty-six cases in 7,545 patients with dyspepsia—were in close accord with those of Eusterman [6] who placed it at one-third of 1 per cent. in over 2,500 operatively demonstrated cases of benign gastric and duodenal ulcer. In those of Smithies' cases in which there had been definite pathological changes the frequency had risen to 1·6 per cent. The post-mortem evidence supported the clinical view that syphilitic lesions of this viscus were of extreme rarity. Morgan [10] stated that in 329 post-mortem examinations upon subjects in whom syphilis had been pathologically demonstrated there had been only four cases of syphilitic lesions in the stomach. Symmers [13] had also only found one such lesion in 4,480 post-mortem examinations. His (Mr. Walton's) experience strongly supported the view that lesions of this nature were rare. In a total of 516 cases of surgical lesions of the stomach there had not been one case in which syphilis was proved to be a causative factor, although in one patient who had had a positive Wassermann reaction, which had failed to yield to many injections of neosalvarsan and other drugs, a chronic ulcer had been found on the lesser curve. Pathological examination of this ulcer had failed to reveal the presence of syphilitic changes. In the London Hospital Pathological Institute there had only been one case in which a syphilitic lesion of the stomach had been demonstrated, and this out of a total of 12,449 post-mortem examinations. This specimen had occurred in the year 1916 and was the one which he was showing that night. He had, however, notes of another case, under the care of Mr. Lindsay, that of a man aged 54, who had had a primary sore at the age of 24. He had presented the symptoms of gastric ulcer and had been operated upon that year (1921). The liver showed multiple gummata and cirrhosis and there was a small ulcer high up on the anterior surface of the cardiac end of the stomach. Probably the variation in the quoted figures might partly be due to the fact that some of the ulcers occurring in syphilitics were not in themselves syphilitic but were simple peptic ulcers. The possibility of such a combination had been indicated by Niles [11], Eusterman [6], Einhorn [5], and Morgan [10]; and Fowler [7] had reported at length an interesting example of such a condition. His own case had certainly been of that nature, and Mr. Lindsay's case was probably another example of it. A positive Wassermann reaction was therefore no direct proof that the lesion of the stomach was syphilitic.

The age of onset of the lesion was very variable. In the series of fifty-nine cases studied by Meyers [8] it had varied from 18 to 60. Forty-nine of these cases had been the result of acquired infection, but in the eight cases reported by Downes [3] there had been only a history of a primary infection in two. The ulcers were said to be deep with much infiltration around, and might show widespread gummatous infiltration causing much distortion of the stomach. Perigastric adhesions were common and there was often widespread scarring which might so obstruct portions of the stomach that operative interference became necessary. In addition there were often very evident changes in the liver and glands. The points in the microscopic appearances upon which stress had been laid in making a positive diagnosis were the atrophy of the mucous membrane with hypertrophy of the submucosa, a dense connective tissue infiltration of the muscularis, and obliterative endarteritis with perithelial lymphocytic infiltration. According to Fowler [7] spirochaetes were not found in the acquired cases, but he (Mr. Walton) understood that Dr. McNee had been able to demonstrate them and their presence must be regarded as the only certain proof of a syphilitic origin. A positive Wassermann

reaction was necessary and suggestive, but it did not exclude the possibility of a peptic ulcer occurring in a syphilitic. The variation in the symptomatology from a normal case of carcinoma or gastric ulcer had been commented upon by many observers but the majority were agreed that the symptoms were very inconstant. The general health appeared to suffer considerably and there was often marked loss of weight. Hæmorrhage might occur, just as with a chronic ulcer, from erosion of vessels. According to Meyers [8] it was present in 33 per cent. of the cases. The test meal did not show constant changes but Downes [3] stated that the free acid tended to be diminished. In Mr. Lindsay's case the fractional test meal taken by Mr. Hunter showed a nearly complete absence of free HCl and a total acidity of 20. There had been only a very slight rise at the digestive period. Blood had been present throughout, and bile had appeared after one hour and forty-five minutes. In his own experience therefore proved syphilitic lesions in the stomach were of very great rarity and must not be diagnosed simply because a known syphilitic had a peptic ulcer. Possibly in his cases some gummatous lesions might have been overlooked owing to the fact that a Wassermann test had not been performed as a routine measure, but such cases must be very few as other diagnoses had in most cases been proved either by pathological examination or in the after clinical course. In future the Wassermann test would be more generally performed.

REFERENCES.

- [1] BIRD, F. D., "Conditions simulating Cancer of the Stomach," *Brit. Med. Journ.*, 1910, ii, p. 952. [2] CASTEX and MATHIS, "Gastric and Duodenal Ulcer with Tardy Inherited Syphilis," *Journ. Amer. Med. Assoc.*, 1918, lxxi, p. 321. [3] DOWNES, W. A., "A Further Report of Eight Cases of Syphilis of the Stomach," *Surg., Gyn. and Obst.*, October, 1917, p. 361. [4] DOWNES, W. A., and LE WALD, L. T., "Syphilis of the Stomach," *Journ. Amer. Med. Assoc.*, 1915, lxiv, p. 1824. [5] EINHORN, M., "Further Remarks on Syphilis of the Stomach," *Med. Rec.*, 1915, lxxxvii, p. 421. [6] EUSTERMANN, G. B., "Syphilis of the Stomach," *Amer. Journ. Med. Sci.*, 1917, cliii, p. 21. [7] FOWLER, W. F., "Benign Gastric Ulcer in a Known Syphilitic," *Surg., Gyn. and Obst.*, May, 1921, p. 419. [8] MEYERS, J. ALBANY, *Med. Annals*, October, 1912; quoted, *Lancet* Annotation, November 23, 1912, p. 1450. [9] LYLE, H. H. M., "Linitis Plastica" (Cirrhosis of Stomach), *Annals of Surg.*, 1911, liv, p. 625. [10] MORGAN, W. G., "Syphilis of the Stomach," *Amer. Journ. Med. Sci.*, 1915, cxlix, p. 392. [11] NILES, G. N., "Syphilis of the Stomach," *Journ. Amer. Med. Assoc.*, 1916, lxvi, p. 564. [12] SMITHIES, F., "Syphilis of the Stomach," *Journ. Amer. Med. Assoc.*, 1915, lxv, p. 572. [13] SYMMERS, D., "Anatomic Lesions in Late Acquired Syphilis," *Journ. Amer. Med. Assoc.*, 1916, lxvi, p. 1457.

Dr. HUBERT M. TURNBULL said that short notice of invitation to speak had prevented him from attempting to elicit evidence as to the frequency of syphilitic affections of the stomach by analysis of the records of necropsies at the London Hospital, making use of the results of the long series of estimations made by Dr. Fildes and Dr. McIntosh of the reaction to the Wassermann test of blood obtained after death. His remarks would therefore be limited to purely histological evidence. Histological diagnosis of syphilitic inflammation was even more difficult in the case of the stomach than in that of other organs. Infiltration with plasma cells, lymphocytes and eosinophil leucocytes was a characteristic of most syphilitic lesions; such an infiltration was found, however, in chronic pyogenic inflammation, and was constant in chronic progressive peptic ulceration. Endophlebitis and endarteritis were characteristics of the more intense syphilitic inflammatory reactions, but they might occur in chronic inflammations caused by any pyogenic organism. They were very common in chronic progressive peptic ulceration. Again, multinuclear giant cells occurred in the intenser syphilitic inflammations, but similar giant cells were present in many other conditions. A few giant cells were frequently seen in the base of progressive peptic ulcers. In some cases their relation to crystals or to granules of pigment showed that they were "foreign-body giant cells"; in other cases they were clearly epithelial in origin and were comparable to the epithelial giant cells so conspicuous in certain chronic pyogenic inflammations of the breast and of the testicle; in other cases the cause and mode of their origin were not indicated. In order to ensure that his memory was not at fault he had examined the slides from the last twelve specimens sent from the operating theatres last year. Infiltration of the above type was present in all; endarteritis was present in five; giant cells were found in three. In a thirteenth set of slides on which it happened that a report had to be made that day, all the phenomena enumerated were represented. If

the mere occurrence of the above histological phenomena was taken as evidence of syphilitic inflammation, then all, or almost all, progressive peptic ulcers must be accepted as syphilitic. But there was definite evidence against the majority of peptic ulcers being syphilitic. A histological diagnosis must be based, therefore, upon a picture in which the mere occurrence of these phenomena was supplemented by features more characteristic of syphilitic inflammation. The only proof of syphilitic infection was the demonstration of spirochaetes which had the morphological character of the *Spirocheta pallida*. Dr. McNee had given them a finished and exemplary pathological contribution; he had proved his specimen to be syphilitic. He (Dr. Turnbull) was glad to learn that in histology his specimen differed from ordinary progressive peptic ulcers; to the naked eye it was obviously no ordinary peptic ulcer. Had it resembled the usual chronic peptic ulcer, then it would have shown that the recognition of syphilis must rest entirely upon the discovery of spirochaetes. If the recognition of syphilis were limited to the discovery of spirochaetes, the diagnosis of the later syphilitic manifestations would be practically impossible in pathological institutes staffed as meagrely as they were in England. Since the year 1909, examination had been made in the Pathological Institute of the London Hospital of 713 stomachs, or portions of stomachs, removed in the operating theatres. In these they had found no syphilitic lesion. In 400 there had been simple peptic ulceration; in four of these the histological diagnosis of "chronic, progressive, peptic ulceration" had been amplified by the qualification "granulomatous." This qualification had been applied because of the extraordinary development and cellularity of the zone of infiltration and necrosis which formed the base of progressive ulcers. But the histological reaction in these four cases did not differ in kind from that found in the ordinary cases; it could not justify a diagnosis of syphilis. In one case a Gram-positive streptothrix had been demonstrated. The stomach had been examined at necropsy in nearly 13,000 subjects since he had come to the Institute in 1907. Any obscure abnormality had been removed for microscopic examination; further, his colleagues and himself had been specially eager to find syphilitic lesions. Their hopes had been raised in early days by the discovery of a few ulcers which resembled the gummatous ulcer of the text-book: ulcers lined by a layer of "lard" or of yellowish glairy substance. Such ulcers, however, had proved to be chronic peptic ulcers with bases occupied by an abnormally deep cellular zone; this zone was traversed by numerous long, vertically directed, Gram-positive streptothricial filaments. In recent years they had got very far behindhand in the microscopic examination of their cases. It was therefore possible that the microscope might reveal evidence of syphilis in some portion of stomach in which such an infection had not even been suspected. But the only stomach in which a tentative diagnosis of syphilis might prove to be correct was that which he had put out for demonstration. Unfortunately the microscopic examination of this case was far from concluded. Properly he ought not to demonstrate and discuss a still incompletely examined specimen, but it was difficult to resist contributing to the discussion something which was not completely negative; moreover, Mr. Walton had mentioned this specimen, and apparently had not made it clear how tentative was the diagnosis at present.

The case (P.M. 155, 1916) was that of a woman, aged 30, who had been admitted after three days of profuse hæmatemesis. She had been six months pregnant. On the day of admission she had given birth to her child and then died.

Summary of Necropsy.—Anæmia. Melena. Caseous, granulomatous inflammation and ulceration of stomach. Hepar lobatum with gummata. Syphilitic inflammation of aortic commissure, ascending aorta, and of portions of descending thoracic aorta. Scarring of soft palate, with almost complete destruction of the uvula. Conspicuous scarring round vaginal orifice. Circular, "tissue-paper" scar on left forearm. Calcareous nodule in gland in hilum of upper lobe of left lung; firm caseous areas in glands upon left main bronchus, in one gland upon right bronchus, in glands of tracheal bifurcation, and in right and left paratracheal glands: large, firm, fibrocaceous left upper lumbar gland; small fibrocaceous right upper lumbar gland. Recent delivery.

The Wassermann reaction of blood which was removed at necropsy was found positive by Dr. James McIntosh.

The ulceration of the stomach was obviously no ordinary ulceration. The ulcer involved the posterior surface of the fundus and the body; it was large (6.5 cm. by 3.2 cm.), and of irregular outline. Its border was considerably raised, and the greater part of it was occupied by numerous sharply defined, branching sulci, by small or

minute, sharply punched out, shallow ulcers, and by areas of "honeycomb" or "rough towelling" which had obviously resulted from confluence of shallow ulcerations. Before fixation the base of the main ulcer had been granular and yellowish grey; on the inner aspect of its thickened margins there had been a layer of glairy yellow substance; similar substance had occupied the base of most of the shallow marginal ulcerations. Histologically, the lesion in the stomach had the characters of an intense, gummatous, syphilitic inflammation. The liver showed syphilitic fibrosis and multiple gummata of origin earlier than those in the stomach; the inflammation in the aorta was that of a syphilitic mesaortitis in which the tracts of granulation tissue were sparse, narrow and contained a few giant cells, whilst extensive areas of the intervening media had undergone recent necrosis. A regional gastric gland showed œdema only. The reaction in the caseous glands, was, in the case of the large, left lumbar gland, much more characteristic of syphilis than of tuberculosis. But he (Dr. Turnbull) had found tubercle bacilli in caseous glands supposed to be syphilitic too often ever to risk a diagnosis of "gummatous" glandular caseation. Further, the distribution of the glandular caseation was a distribution typical of a spread of tuberculosis from a primary focus in the hilum of the left lung. He would be astonished if the lesions in the liver and aorta proved to be tuberculous, but it was obvious that before any of the lesions, and particularly the lesion in the stomach, could be presumed to be syphilitic, the presence of tubercle bacilli must be most carefully excluded. To prove that any of the lesions were syphilitic, spirochætes must be found. At the necropsy they had taken portions from the stomach, liver and left lumbar gland, and put them through Levaditi's process with a control. A few sections had been examined and no spirochætes found. Last summer he had seen Dr. McNee's beautiful preparations. Inspired by Dr. McNee's success he had put eleven more pieces from the stomach through Levaditi's process. For the purposes of that meeting they had examined one section from each of these eleven blocks. In none had they found a spirochæte.

The Royal Society of Medicine.

President — Sir JOHN BLAND-SUTTON, F.R.C.S.

OCCASIONAL LECTURE.

The Treatment of Diabetes and Gout by Disintoxication.

By Dr. G. GUELPA.

MORE than twenty years ago an idea dawned on my mind. Little by little this idea has grown and been fertilized by my researches, and the observations which I have made in the course of my medical practice. It first assumed a definite form owing to what were, for me, the memorable experiments, made by my teacher, Dr. Dujardin-Beaumetz, Member of the Academy of Medicine, and Physician to the Cochin Hospital at Paris. He proved irrefutably that, in typhoid, the more the bodyweight fell the greater was the improvement; whereas if the weight remained stationary, and still more, if it increased, the temperature continued to rise, and the general state of the patient was aggravated. I have lost no opportunity of confirming these observations, both in clinical practice and in the laboratory. In my view they indicate that the diseased organism is encumbered with harmful waste products, and that the more quickly it can get rid of them, the more rapid will be the recovery.

To attain this end I needed a method which should not only be constant but free from danger. A number of devices were discarded in favour of fasting, associated with purging. I insist upon absolute fasting from food, and drinking freely of as much warm water daily as possible; this promotes the elimination of waste products by the organism, which are either destroyed *in situ*, or removed by diuresis. Purging not only acts rapidly and mechanically, eliminating the intestinal poisons, the primary cause of auto-intoxications, but also drains them from the circulation by osmotic action. In this way it provides the essential double action of a method, which the physician can use with confidence and success against disease in the interest of his patients.

The association of prolonged fasting, repeated at intervals, and copious watery purgation, is essential to secure a thorough cleansing of the organism. My long experience has shown that either of the two means employed alone, rarely and with difficulty results in success. If the purge be not vigorous disintoxication is slow and uncertain. I attribute the incomplete results of methods, similar to my own, practised on the other side of the Atlantic, to the failure to associate fasting with purging.

Purging and fasting, on the contrary, carried on conjointly for several days together, even for a week, apart from certain slight and relatively insignificant symptoms, always yield surprising and constant results. The most important of these are:—

(1) An almost complete disappearance of the intestinal flora and an attenuation of the vitality of micro-organisms in other regions (for instance, the varied manifestations of staphylococci).

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(2) A regularization of the pulse and diminution of blood pressure, increase in the number of red globules, and greater equilibrium of the leucocytes.

(3) Reduction of the volume of the principal viscera, especially the heart and liver.

(4) Progressive loss of body-weight which can be regulated at will.

(5) Disappearance of pains in the joints, of muscular stiffness, and of difficulty of breathing, &c.

(6) A sense of well-being, with greater activity and clearness of thought.

Many other advantages may be gained from this regulated association of fasting and purging. It provides us with a means of relief, comparable to pure air, rest, and a suitable temperature, the supreme desiderata in the prevention and cure of disease.

The limited time at my disposal will not allow me to discuss these very important deductions; but you will find a fuller explanation in my book, "The Guelpa Method," a copy of which I have presented to the Society. Notwithstanding the disadvantages attaching to a general review of dis-intoxication, I shall be able to indicate certain applications of it, either as a hygienic procedure, or as an auxiliary or curative process, directed against diseases, and particularly diseases of nutrition.

The treatment of diabetes has provided me with valuable evidence of the validity of my theory. The following is a brief report of the first case in which I applied the treatment.

One of my patients, apparently in good health, had more than 100 gr. of sugar. He consulted me in order to know whether he could insure his life, and I pointed out to him that the presence of sugar in the urine would, in ordinary circumstances, prevent the acceptance of the risk. At that time I was myself undergoing experimental fasting and purging. It occurred to me that this treatment might cure diabetes, so I proposed to my patient that he should submit himself to the treatment I was investigating. My patient, who had a very good appetite, agreed, though somewhat unwillingly, to accept my proposal.

The result of the treatment was more favourable than I could have hoped. After two days of purging and fasting the sugar had disappeared, and on the third day the patient, after medical examination, obtained his insurance contract. This was fortunate for his family, as he died two years later from a tumour of the shoulder, though his diabetes was cured. This result, resembling as it did, a laboratory experiment, was a valuable lesson to me and much encouraged me to persevere with my method.

At first I limited the application of my treatment to diabetes. I cannot in this short lecture even enumerate the principal observations which I made. It is worth while however giving a short summary of a few specially selected cases.

A youth, aged 16, who had been a patient for some months at the Tenon Hospital, had 1,200 gr. of sugar *per diem* in 14 litres of urine. Every known treatment had been tried, but it was found impossible to reduce the sugar below 400 gr. In my turn I attempted to treat this patient at the hospital. I was unable to effect the complete disappearance of the sugar because the patient resented discipline, and, tempted by his comrades, disobeyed my orders. I therefore took him into my house, where I could give him encouragement, and watch him. This enabled me to carry out the treatment rigidly and thoroughly. I was right. In fifteen days, during which the patient undertook two fasts of respectively five and six days, separated by four days of reduced

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diet, the sugar had completely disappeared, and the quantity of urine was reduced to a litre; the cedema and cyanosis of the face had also disappeared, and the patient's general health was completely restored.

I was called to a consultation three years ago, in the case of a fellow practitioner, occupying a very high position in the Army Medical Service during the war, and Laboratory Director of the Collège de France. He passed 7 litres of purulent urine with 300 gr. of sugar and 2 gr. of albumin, betokening grave pyelitis. He had already consulted the leading specialists and tried a number of treatments without the least success. He was reduced to an alarming state of emaciation when I saw him.

When I proposed my treatment, i.e., three days of absolute fasting to begin with, and purging, he and his friends hesitated considerably. The treatment appeared to be too severe in view of the great weakness of the patient. But when he was assured that there was no danger and that probably there would be an immediate improvement, he consented, and he had no reason to regret his decision. In three days the mental and physical condition of the patient was profoundly changed. The quantity of the urine had decreased to 2 litres, the sugar to 10 gr., and the albumin to 2 gr., a good result when compared with the figures of the original condition.

When a restricted diet was prescribed the sugar and other diabetic symptoms returned, but with very much less severity than before. Repetition of the treatment, almost weekly, alternating with periods of low-diet, resulted in the disappearance of the sugar and in the recovery of the patient who was able to resume his arduous duties.

A much more surprising case was that of a Parisian lady, the mother of a well-known surgeon. For over twelve years she had suffered from diabetes with more than 300 gr. of sugar, together with paresis of the lower extremities, which made it impossible for her to stand without support from the walls or furniture of her room. I was consulted after she had submitted without success to the treatment prescribed by a number of specialists. Notwithstanding the paresis, as the general health was good, and there were only 300 gr. of sugar in twenty-four hours, I predicted that the glycosuria would probably disappear completely in less than a month. It did so, even earlier than I had expected, in three weeks, with a corresponding improvement in the general condition. However, the paresis of the lower extremities persisted.

As I was acting as consultant, I suggested to the lady's son that he should ask some specialists, who were friends of his, to try the usual electrical treatment. This was carried on very carefully for a month without improvement. I became convinced that the paralysis was merely a symptom of diabetic intoxication, and that therefore perseverance with disintoxication should remove it. I explained this to the patient, who consented, being favourably influenced by the success which I had already obtained. The disintoxication treatment was resolutely adopted. After several periods of four-days' fasting she succeeded in walking very well, and a month later presided at the festivities of her daughter's marriage. There was no recurrence of the paralysis during the rest of her life. However, she had a serious motor accident while staying in the country near Fécamp—severe contusions and a fracture of the pelvis, with hæmaturia. Serious complications supervened—glycosuria, with intense fever (40° C.), which brought her very near death. I was summoned to the patient, whose condition was desperate. I arrived at night, and, in spite of her high fever and great weakness, administered immediately 50 gr. of sulphate of sodium, followed at two hours' interval by a

strong purgative enema to stimulate the disintoxicating action. Next morning I repeated the purge. There was a great change; the fever had abated, the injured lady had recovered full consciousness, and the disease had taken a favourable turn, so much so, that a month afterwards she could be moved to Paris, where in a comparatively short time she completely recovered, owing to the prolonged treatment by disintoxication.

This patient provided an almost complete résumé of diabetic pathology. Some time after her recovery she gradually increased her ration little by little, and then by degrees she developed diabetes once more with various complications. At one time she was attacked by a most painful cervical neuralgia. After trying many different treatments she was finally relieved by disintoxication, which at first she had refused. Another time she suffered from a very painful and obstinate costo-abdominal neuralgia, which was speedily relieved. Later on choroiditis and glaucoma were cured in the same way, after she had been treated without success by a distinguished specialist. Repeated errors in diet brought on the same complications: she was cured twice, but on the third occasion the symptoms did not disappear, and she became completely blind. She died two years ago with cerebral symptoms, ten years after I first attended her.

Disintoxication has a remarkable effect in cases of diabetic gangrene. The development of the disease is arrested at once; the next day improvement is evident; there is a decided diminution of cyanosis, and the tint of the skin gradually becomes rose-coloured. Those tissues which were already necrosed at the beginning of the treatment still remain so, and must be removed by suppuration or surgical intervention; but all tissues not actually dead at the time of intervention return to their normal condition.

The following is another very significant and typical case: Before the War a country doctor, the father of a friend and colleague of mine, had suffered some years previously from serious diabetes, with gangrene of the foot, which necessitated the amputation of his leg. Some time afterwards gangrene appeared in the other leg. His son, to whom I had explained some days before my ideas on diabetic gangrene, hastened to impress on his father the urgent necessity of carrying out my treatment. The patient lost no time; he submitted to a rigidly severe treatment, and the gangrene ceased. He soon completely recovered. Since the War our *confrère* has repeated the treatment every now and then as a precautionary measure. He keeps well and can use his leg.

Another very suggestive case is that of an Englishman, an industrial magnate, living in New York. He came to Paris for a holiday. As he was getting into a carriage he struck his foot against a step. Immediately afterwards the foot was so painful that he had to go to bed. The little toe swelled and turned bluish-red. From this focus tumefaction and redness gradually spread over the whole foot. The doctors in charge of the case, finding 300 gm. of sugar and 4 gm. of albumin in the urine, discovered the cause of the rapid progress of the gangrene. They were alarmed, and at once used heated air preliminary to the amputation of the leg. It was in this stage that I was consulted. I immediately gave the patient a purge, and repeated it during the three following days, stopping all food for the same period. The gangrene was completely arrested, and from the second day the foot lost its bluish colour; it was less swollen, and the skin became rose-coloured. The sugar had almost disappeared, and the albumin had dropped to 2 gm. The improvement continued in spite of the giving of food (though restricted), which I had allowed

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for three days. The repetition of the treatment and of the restricted diet brought about the complete disappearance of the sugar in fifteen days. There still remained 0.5 gm. of albumin, because, in spite of my insistence, the patient would not consent to entire abstinence from alcoholic drinks. At that time it was found necessary to amputate the little toe, the phalanx of which was already necrosed when I was called in. One month after his accident the patient was able to continue his pleasure tour in the south. Long afterwards I heard that he had gone back to America and that he was very well.

It may be said that such results are merely exceptions. This is not so. The issue of the cases I have treated leaves no doubt in my mind that treatment by disintoxication is always successful. Moreover, the thesis of Dr. Bellec (Lille) and of Dr. Waissmann (Bukarest), as well as Dr. Kellogg's communication to the Society of American Physicians, demonstrate the truth of my observation. Dr. Kellogg declared that with 267 diabetics whom he had attended at a sanatorium, he had obtained striking and uniform successes by means of disintoxication.

I said at the International Congress of Medicine, held in London in 1913, that fasting and purging, strictly carried out, yield far better results in the case of diabetes than the use of quinine in the treatment of malaria, or that of mercury and arsenic in the treatment of syphilis. The efficacy of this remedy against diabetes would be almost absolute if it were carried out with the necessary energy and perseverance. Unfortunately this is not the case. The physician, owing to a lack of experience, finds his mind dominated by fear of the so-called weakness which is due to intoxication, and therefore dares not carry out the purging and fasting treatment with the requisite vigour. The patient, finding how easily he has lost his diabetic symptoms, fails to realize the seriousness of the disease, refuses to submit to discipline, and goes back to those errors of diet which caused the previous attacks. Thus it is safe to state definitely that failure results from a want of faith, which deprives the physician of the necessary perseverance and energy in carrying out the treatment.

I will say no more on the subject of diabetes. I hope that you will examine and verify in practice the facts which I have put before you; I have no doubt as to the result.

Diabetes constitutes one of the types of the diseases of nutrition. The arthritic pathogenesis of the other affections of the same group is almost identical, and the treatment also should be almost identical. Let me remind you of the theory of F. Glénard, who did so much for the knowledge of what is still called "arthritis," but which he called "hepatism," because he found a functional trouble of the liver to be a common element in all the manifestations of this diathesis; that is to say, an intoxication caused by imperfect digestion of food, resulting in an increase of endogenous and exogenous waste products. According to F. Glénard, the two fundamental manifestations of arthritis and hepatism respectively—choleine and uricemia—are both caused by hepatic insufficiency; but while this insufficiency is recognized in bilious lithiasis, cholecystitis, angiocholitis, &c., it is often unrecognized in obesity, diabetes, gout, and rheumatoid arthritis.

To-day this function of the liver, and consequently of the endocrine glands, tends to be more and more universally admitted; but what is less easily admitted is that this deficiency, or deviation of secretions (by excess or defect), results in two forms of auto-intoxication, one acid and one alkaline. The type of acid

intoxication is diabetes; the type of alkaline intoxication by potassium or lime or magnesium, is gout. Diabetes and gout are both of them intoxications, and are therefore amenable to treatment by disintoxication. The first and essential object of this is to eliminate the poisons in excess, whatever be their nature; but as the nature of the humours which characterize them differs, the treatment (especially the dietetic treatment) must be adapted to this difference. In diabetes the object should be to get rid of the circulating acids, and to hinder their production by drinks and foods rich in alkalies; in gout, on the contrary, one should use distilled drinks, and food as poor as possible in mineral matters, i.e., boiled or distilled water, meat, and phosphoric or hydrochloric acid. This was the opinion of Joulie, who had already discovered that, contrary to a long-received opinion, gouty patients are often hypo-acid, if not completely alkalinaemic.

Garrod's famous experiments demonstrating an excess of uric acid in the blood have dominated the conceptions of academic medicine for nearly a century. His results were badly interpreted. An isolated fact, the presence of uric acid in the blood, was established as a dominant indication for treatment, which excluded meat and vegetables and replaced the uric acid foods by alkaline mineral waters. This is a disastrous error in practice which has unfortunately lasted too long. Under this method of treatment gout not only remains uncured, but ankylosis is accelerated. It cannot be otherwise, since vegetables and mineral waters are highly charged with lime-salt, which lowers the acidity of the blood and results in increased precipitation of the earthy salts in the joints and other parts of the body predisposed to precipitation. This terrible disease can only be fought with meat, a chalk-free ration and acidulated drinks which diminish the calcareous ration, and aid in the solution and elimination of the precipitated salts in the body. Professor d'Arena's much applauded recent communication to the last Congress of Medicine at Naples here quoted, strongly upholds this view.

"Adequate but sufficient comparative observations in cases of gout and rheumatoid arthritis demonstrate a notable increase in alkalinity in the blood,¹ as well as an increased amount of both uric acid and calcium, when compared with normal standards. Uric acid and chalk are diminished in the urine.

"Further, in cases submitted to disintoxication treatment, the alkalinity of the blood diminishes to the normal . . . the uric acid and calcium found in excess in the blood, after a preliminary rise, gradually fall till the uric acid disappears from the blood, while it simultaneously increases in the urine.

"The decreased alkalinity coincident with the diminished amounts of uric acid in the blood is found to be associated with a notable improvement in the general state (the disappearance of tophi, the improvement of deformed articulations, the disappearance of desquamations, &c.). Therefore decreased alkalinity favours the solution of urico-calcic deposits, permitting them to be eliminated by the urine. These phenomena show that, within the physiological limits, the organism enjoys the faculty of utilizing a regulating element, a defensive device against the effects of those toxic products which are derived from regressive cleavage of proteids and hydrocarbons."

But the cases I propose briefly to report to you will convince you far more forcibly than theories. It is scarcely necessary to add that the treatment based on this point of view has been practised in Great Britain. Thus, for example, Golding Bird and Owen Rees protested long ago against the use of alkalies in gout, holding that it transformed acute gout into chronic torpid

¹ Sir William Willcox, having read this statement, wished to know how Professor d'Arena determined the alkalinity of the blood. Dr. Guelpa undertakes to ask Professor d'Arena to communicate this information in a letter in the medical press.

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gout; and in America, Salisbury and Mortimer ordered meat to their gouty patients at least for some weeks. These last-mentioned practitioners obtained remarkable results, but the treatment was given up because of the exaggerated use of flesh food. The lack of the necessary disintoxicating and eliminating action in purgation and fasting mathematically reproduces conditions which it is the object of my treatment either to remove or avoid.

A great number of diseases, called arthritic, will be found to be either attenuated or to disappear after disintoxication. In this way you may attain very satisfactory results in cases of migraine, asthma, gastro-enteritis, and a great many skin troubles, &c., when they are not the outward manifestations of certain other diseases which are more or less incurable, such as tuberculosis, cancer, &c.

I cannot possibly discuss these conditions. I must therefore confine myself to a brief review of the remarkable results obtained in those cases of gout which hitherto have been practically incurable. My experience is sufficiently reinforced to enable me to state with confidence that gout ought no longer to be looked on as an incurable disease, and that it may easily be avoided, even in cases in which it is hereditary.

I will now relate some facts which will convince you. They will persuade you better than my opinions.

A male patient at the Tenon Hospital, in 1908, had suffered from gout for more than thirty years. During this long period he could not work more than six months in the year, for the rest of the year he was confined to bed. He had been helpless for more than three years. He could not dress himself, and was either bedridden or in his room, either at home or in the hospital. Nearly all his joints, including those of the vertebral column, were more or less swollen and ankylosed. I undertook the care of this case at the hospital after many other physicians had treated him without satisfactory results. I soon decided to have him moved to my flat, so as to be able to supervise the treatment and demonstrate the truth of the idea I had as to the nature of his disease. I kept him under my care five months, but during the last two months I had the satisfaction of seeing that he could do errands for me in town, and that he only required the help of a stick in walking. He went on several occasions to the hospital, where he aroused great interest on the part of Dr. Gaussade and the students. The patient was so keen about his cure that he often continued the fasting and purging for six or seven days on end. Consequently he made rapid progress, especially during the last days of his fast.

But in those days the great benefits derived from purging and fasting in gout were lessened by the alkaline ration which was prescribed. I recognized that I was carried away by the results of my restricted vegetarian cure in cases of diabetes, and that my conception of the nature of auto-intoxication in gout was faulty. For this reason the process of recovery was relatively slow and was possible only because of the unparalleled strong will and energy of the patient.

It is only through the very attentive observation of patients treated at my flat that I discovered the error I had committed in prescribing a vegetarian diet and mineral waters, the alkaline and mineral qualities of which could only favour the precipitation of lime salts from the blood into the joints. There was some excuse for my mistake, as it was then considered correct to say that gout was caused by excessive uric mia. I since proved that this opinion is mistaken, and that failures and disasters in the treatment of gout resulted from the absolutely false pathogenesis on which it was based.

After long and assiduous study the idea came to me like a revelation. Its reception in my mind was hastened by the inestimable advantage of my being able day and night to watch the patients I had in my house. It was then that, without full knowledge of the previous work of others, I began to understand, as I told you just now, that there are two kinds of auto-intoxication, one acid and the other alkaline, and that consequently the regime which I applied with so much success in cases of diabetes was not suitable for gout.

As soon as this truth dawned upon me, the pathogenesis of gout became clear in my mind, and my treatment became comparatively simple and successful, as can be seen from the few cases now to be recorded.

Last year a chemist, aged 72, weighing 90 kg., had suffered for three years so severely from gout in all his joints, including the vertebral column, that for more than six months he could neither walk nor even stand. Only with the greatest difficulty was it possible to dress him and move him in an arm chair from his bed to his desk, and there he remained as motionless as a patient with Parkinson's disease, his head fixed rigidly by cervical arthritis. I was called in consultation by his physician, Dr. Weber, and after my first visit I told the patient, without hesitation, that he would soon be better, and perhaps would soon be able to walk. Although he did not conceal his doubts, he conscientiously submitted to my treatment. My prognosis was realized more quickly than anyone would have believed. At the end of ten days the patient could walk, with difficulty, but without help, from his bed to his desk, and could walk up and down stairs of ten steps. But what is still more surprising, after forty-two days' treatment, he was able to go down three storeys, walk a kilometre, and go up to his room by himself.

This brilliant result was only made possible by the devoted and assiduous care of his own medical man. But as soon as this great improvement was achieved, the patient dispensed with Dr. Weber's attendance; the improvement in his condition first diminished and then disappeared. Without having lost the benefit derived from the treatment, he is now, a year afterwards, no further on the road to complete recovery than when his doctor gave up his visits.

Gout is difficult and discouraging to treat, on account of the length of the treatment. But it is in the power of the doctor to command complete success. The treatment, again, is both difficult and discouraging, when one is dealing with an undisciplined patient. The changes are slow. The intelligent co-operation of the patient in a long, trying effort requires unwearying, energetic encouragement from the medical attendant. One of the great prelates of the British Roman Catholic Church came to Paris to be treated for gout, which was gradually ankylosing all his joints. He had been unable to celebrate Mass for six months on account of ankylosis, and the pain caused by any movement of his knees. A well-known physician had already treated him for this gouty rheumatism without success. He came to me with a story of failure. After three days of purging and fasting with suitable exercises, the patient had gained enough flexibility of movement to be able to go up and down, though painfully, the twenty steps of his staircase, and on the twelfth day—after eight days of purging and fasting, divided only by one period of restricted acidulated meat diet, he could go up and down three flights of stairs and kneel to celebrate Mass. Two days later he was able to go back to England, where he was urgently summoned by the duties of his ministry.

The following instance is a much more conclusive demonstration of the complete success of my treatment of gout and its consequences, even the

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gravest. It shows at the same time the necessity for careful and constant supervision on the part of the doctor.

Last April I saw a lady living near Paris, suffering from gout. She had been ill before the war and had not left her bed for three and a half years. She was unable to make the least movement without cries of pain. All her joints were more or less swollen and ankylosed from the nape of the neck to the extremities. There was also a very serious complication—i.e., coxalgia of the right hip, with subluxation of the head of the femur, causing a half-flexion of the knee with external rotation, at right angles to the feet. In spite of this the general state of the patient remained good. Needless to say, every resource of medical science suitable for such cases had been tried. Antisyphilitic treatment had been twice applied, in consequence of two misleading Wassermann reactions, but without the least result on both occasions. Eighteen doctors had attended her and she had even gone into hospital.

I was called in consultation for the first time last April, with Dr. Leclerc Montmoyer, the patient's medical attendant, whom I had seen thrice within four months. In spite of the strong will and sustained resolution of the patient and her friends, the disease resumed its course after a short period of improvement. I was much disappointed because I was convinced that much better results could be obtained. I advised the patient to come to my house, where direct and constant supervision might explain the cause of failure. I was quite right. Intense care, particularly as regards avoidance of exposure to cold, with exercises given at exactly the right moment, led to a decided improvement from the first, which continued without interruption during the two months the patient stayed with me. At the end of this comparatively short time the patient was able to return to her home, walking with crutches. She is now carrying on the treatment courageously, and can walk about her house with a single crutch.

I could cite a great many other most extraordinary cases of invalids who were supposed to be incurable, but who have recovered, thanks to the logical and serious application of disintoxication treatment. I will only record in detail one case more which exhibits in itself almost all the pathology of gout in its most serious form. It is that of a young lady, aged 35, from Belgrade. She arrived supported with the greatest difficulty by two nurses. Almost all her joints were ankylosed and the ankylosis of the cervical vertebrae gave her the appearance of a patient with Parkinson's disease. She could no longer sit down on account of the almost complete ankylosis of the joints of her hips and knees. Nine out of ten fingers were more or less fixed on the corresponding metacarpal bones. The appearance of this case was one of the saddest sights possible. She had been in that state for more than ten years. She had consulted the most eminent doctors of Belgrade and Vienna, and had been treated at the best bathing stations of Serbia and Austria. She had at last lost all hope; but in the end, in spite of her terrible condition and the great difficulty of undertaking such a long and painful journey, she had the will and the courage to be moved to Paris. When she sought my assistance I was at first perplexed in presence of deformities so extensive and of such long standing; but the patient seemed so much inclined to undergo the treatment, however long or severe, that I decided to attempt this by no means encouraging enterprise, sustained by the conviction that I should at least produce some slight improvement in her condition. The only movements she could still make were quite small steps, when her attendants had dressed her and stood her upright. She could also knit and write, although her hands, on account of the

ankylosis and twisting and the way they were bent inward, looked like walking crabs.

The photographs and radiographs of her hands (now shown) give some idea of their deformity. Some of the dislocations were complete. In the dorsal region of these joints there were swellings completely deforming the hands and a tophus the size of a pigeon's egg was found near the right olecranon. The first disappeared, the second softened and diminished to less than half its size. At first sight such deformity appeared to be incurable. I thought so myself, but afterwards became quite convinced that once the cause of such deformity disappeared nothing would oppose the return to the normal state.

My conviction was strengthened by the result in the case of another patient, who had his knees completely ankylosed and fixed at right angles for six months, but afterwards his joints became sufficiently flexible to allow him to walk with crutches.

But to return to the case under discussion: the following is the treatment with which I began:—

(1) Fasting and purging for four successive days with abundant watery drinks.

(2) The four following days, restricted meat diet, fruits, and sweet drinks made with distilled water and a little citron juice or with five drops of phosphoric acid to the glass of fluid.

The invalid bore this first experiment well, and therefore I did not fear to intensify the severity of the treatment. In the end she submitted to a six days' fast, with purging the first, third and fifth day, followed by two days only of meat and acid diet. The treatment proceeded almost without modification for four months on end. Already at the end of that time the result exceeded our greatest expectations. The patient, who weighed 76 kg., with a height of 1 metre 60 cm., and whom long and almost complete impotence had reduced to the form of a shapeless mass deprived of vitality, was completely transformed. She only weighed 64 kg., she looked well and had a bright rosy colour. She held herself upright, and walked in the streets without assistance; her hands and fingers resumed their freedom and normal power of movement. The radiographs taken on her arrival and three months afterwards show better than anything else the wonders accomplished by the treatment, even the spontaneous reduction of complete dislocations extending over so many years. The patient, who had come from Serbia supported by two assistants, went back to her country four months afterwards, making the long and difficult journey alone. This is a very instructive case for future treatment of articular deformities.

Lastly, I will refer to a very serious case of aneurysm of the aorta in the hope of opening up a new and promising method of treating a disease which is the dread both of physicians and of the friends of the patients.

Six months ago a man, aged 78, very seriously ill, in great distress, with a subicteric complexion and with a feeling of suffocation at the least movement, came to me after treatment without result by many leading physicians. He had a large aneurysm of the aorta 13½ cm. in dimension. The smallest exertion might have precipitated a catastrophe.

My theory is that aneurysm is often only a manifestation of gout in the arteries, and I did not hesitate to apply in this case a decalcifying treatment, although it was opposed to the usual practice. Without detailing this treatment, which is the same as I habitually use for gouty cases (three to six days

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of fasting and purging, interrupted by three days of meat and acid diet), I simply report that the patient lost 15 kg. of weight in three months; his manifestations of distress disappeared, and—what is a most remarkable fact—the dimensions of his aneurysm were reduced from $13\frac{1}{2}$ cm. to about 8 cm. The patient became so vigorous that he ventured to climb on a portable set of steps. But he fell from a height of about $3\frac{1}{2}$ metres, and dislocated his shoulder and fractured a rib. Notwithstanding this, the aorta resisted the shock, and to-day the patient is in excellent health. The fact needs no further comment.

I could record many other cases, more or less striking, but must conclude with the belief that the time devoted to listening to me will not be entirely lost, either for the advancement of medical science or for the good of your patients.

DISCUSSION.

Sir WILLIAM WILLCOX said that the Fellows of the Society fully appreciated the important influence which Dr. Guelpa's work had had in modern medicine. One of the greatest medical achievements of modern times was the discovery that the glycosuria of diabetes could be removed with certainty by fasting, and it was realized that this discovery was first made by Dr. Guelpa and published by him in 1908, although later, in 1914, Allen in America and Graham in this country had further elaborated the treatment of diabetes by fasting. It was a great advance in medicine that the symptoms of diabetes, which were really due to the presence of excess of sugar in the blood, could be effectually controlled and removed. Previously the treatment of diabetes had been most unsatisfactory. Drug treatment had been found useless, and under the former methods of dieting deaths from acid intoxication frequently occurred. In consequence of the knowledge gained of the fasting treatment of diabetes, at the present time diabetic patients might die of intercurrent diseases, but it was rarely that death was directly due to acidosis or other symptoms of diabetes so long as the patient had been treated on modern dietetic lines. The application of Dr. Guelpa's method of treatment in other diseases, such as gout and toxemia of various causation, was a point of the greatest interest.

Dr. F. PARKES WEBER pointed out that aortic aneurysm was generally syphilitic in origin; he feared that Dr. Guelpa's remarks on the subject might lead to some misunderstanding.

Dr. GUELPA (in reply) said that if aneurysm was syphilitic in origin why was it that antisyphilitic remedies failed in the treatment of aneurysm while disintoxication had led to recovery in four cases at least?

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Section of Anæsthetics.

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Report on Visit as Official Representative of the Section of Anæsthetics to the First Meeting of the Canadian Society of Anæsthetists at Niagara, and to the Meeting of the American Society of Anæsthetists at Boston, in June, 1921.

By H. EDMUND G. BOYLE, O.B.E.

WHEN the Section elected me as the official representative to attend the inaugural meeting of the Canadian Society of Anæsthetists, I promised that on my return I would give a full account of what I had seen and heard.

Upon my arrival at New York on the evening of May 21, I at once got in touch with Dr. Gwathmey, and he arranged for me to accompany him to a private case next morning at 8.30, at a private hospital somewhere near Central Park. This private hospital would correspond to some of our homes in London—such as the Duchess—but the appointments of the theatre, although a great deal better than at some of our homes in London, left much to be desired. The operation was curetting, and the patient, a young lady, had been given $\frac{3}{4}$ gr. morphine, atropine $\frac{1}{100}$ gr., and 300 c.c. of a 4 per cent. solution of magnesium sulphate subcutaneously. The anæsthetic was gas and oxygen, and the anæsthesia was perfect. Instead of using ether, Dr. Gwathmey put 3 minims of paraldehyde into the ether bottle, and showed me the effect of allowing the gas and oxygen to pass over this small quantity of paraldehyde. The breathing deepened, and the patient soon became cyanosed, so the paraldehyde was turned off and more oxygen given. This injection of morphia and 4 per cent. mag. sulph. is largely being used by Gwathmey and others and appears to give excellent results. The morphia is given in three doses, with an interval of fifteen minutes between each, and then fifteen minutes after the last dose the 300 c.c. of mag. sulph. are run into the axilla or groin. I do not know how the effect is produced, but apparently the combination of morphia and mag. sulph. given in this way prolongs and intensifies the action of the morphia. This patient was conscious within three minutes of the end of the operation, and quite well. I was told that she would be put into a darkened room, and would go off to sleep for three or four hours, and awake quite fresh and well.

Next morning I saw a case of synergistic analgesia at the Skin and Cancer Hospital. The operation was for glands in the neck, and the operator Dr. Egger. The patient had had the following preparation: 5 a.m., enema; 6 a.m., chloretone suppos., 20 gr.; 7 a.m., 300 c.c. of 4 per cent. solution of mag. sulph. subcutaneously; morphia sulph., $\frac{3}{4}$ gr., and atropine, $\frac{1}{100}$ gr., hypodermically. *Per rectum*: Ether, 2 oz.; olive oil, $\frac{1}{2}$ oz.; paraldehyde, 3 dr. The operation was timed for 8 a.m., but did not start until about 8.40 a.m. There was a slight reflex on the skin incision, but after that the patient was quite quiet and did not appear to be in pain, but yet was quite conscious.

Being curious about this, I determined to see some more of these cases, so next day I returned to this Skin and Cancer Hospital, and saw Dr. Lye

operating. It was an amputation at the shoulder-joint. The patient was given practically the same as the last, except that the olive oil was raised to 2 oz. When the first incision was made this man began to move his legs; the arm was strapped to the side of the table. He began to groan, so a couple of tubes were passed into his post-nasal space, and ether vapour delivered this way by motor. Very little ether was used, and after three minutes there were no more signs of disturbance. He remained in a perfectly analgesic state, very quiet, and apparently in no discomfort. As soon as the limb was removed from the body I raised the towel from his face, and asked him if he was in pain, and he replied "No," and said he felt well. As soon as the operator and his assistants had stitched him up they told him to sit up, and then they bandaged him.

Another case was one of carcinoma of the jaw. The condition of this patient was not good: he would not stand the anæsthetic at all, probably because he had been kept waiting too long, so that the effect of the combination which had been given him had worn off a good deal. He was given C.E. mixture into his post-nasal space.

That morning I also met Dr. Lumbard, one of the leading anæsthetists in New York. He presented me with what is known as the Lumbard airway (shown).

Dr. Bennett, also one of the leading anæsthetists of New York with whom I had got into touch, asked me to come to the Roosevelt Hospital. There I saw Dr. Erdmann operate on a case of inguinal hernia and excision of the gall-bladder in the same patient, a woman. Dr. Erdmann completed the operation well within forty minutes. Dr. Bennett gave gas and ether with a Bennett inhaler; I think he practises almost entirely on the teaching of the late Sir Frederic Hewitt. He is one of the few men in New York who use much chloroform.

Afterwards Dr. Bennett took me down to the main theatre of the Roosevelt Hospital, where we found gas and oxygen anæsthesia in course of being given by one of the interns for a case of diverticulitis, and they were using simply two cylinders attached to the table; it was one of the best gas and oxygen anæsthesias I have seen. This anæsthesia very much impressed Dr. Bennett, because he is one of those who never take part in discussions on anæsthesia, and never writes anything, neither does he attend meetings; he contents himself with gas, ether and chloroform. He had never given gas and oxygen in his life, and he did not realize that such good results could be obtained.

The next case was one of glands in the neck. The anæsthetic was gas, oxygen and ether, followed by ether post-nasally by means of tubes, and very fine anæsthesia it was. The machine (a Connell) appeared to be very efficient. Next morning there was an operation for tonsils and adenoids, in a doctor's child. I do not know the name of the surgeon who operated. The child was given gas, ether, and chloroform in a Junker's inhaler of the antiquated pattern, with the straight little bottle of the type which exists in old hospitals to-day. The anæsthesia was very good, and I saw, for the first time, that the blood was sucked out of the throat by means of a pump, with the use of which I was much struck.

From that case I went to the Haarlem Hospital on the other side of the City, in the Black quarter, to see Dr. Lumbard demonstrate his method of giving ethyl chloride, and saw five or six tonsil and adenoid cases operated upon there. The method was carried out by means of a Yankauer mask, covered with several layers of gauze, on to which Dr. Lumbard sprays ethyl chloride until the child begins to get confused and cannot pronounce numbers

properly. Directly that happens, he takes the tin of ether and pours it on fairly fast, and as soon as the child's breathing deepens and becomes stertorous, he covers over the whole apparatus with a sheet of rubber, with a hole in it the size of a shilling. That converts what has been the open method into a partially closed method, and he then pours on more ether. The patient is wheeled into the theatre, where one of the interns takes charge. The intern has a suction machine; he attaches one of the tubes of the pump to his gag, and ether is blown into the post-nasal space, and blood is sucked out by the pump. I saw this done in five or six cases, and they all did well. Subsequently I saw that this pump was used almost everywhere that I went where throat cases were dealt with, and before I left I bought this little pump and tried it for myself (shown). It is compact and is very useful for private work. It does not make very much noise when it is switched on; you can attach the sucker to this bottle, and then all the blood is sucked into it and the patient does not swallow any. On the other side you have a bottle into which you can put any sort of mixture, and it is delivered by this other tube. Care must be taken not to let the sucker become choked up; the bottle must not be allowed to get too full, and the sucker must be flushed through periodically. Once my machine would not work and I found that this tiny valve was choked with blood-clot, which necessitated taking the whole machine down and freeing it from blood-clot.

That same morning I went over the Haarlem Hospital, which is a very fine building. There I saw the largest case of hydrocephalus I have ever seen; it must have measured fully 36 in. in circumference.

We left New York for Niagara and the Congress started next day at 9.30 a.m. My views on the various subjects under discussion were asked for, and the strain of listening to and discussing papers from 9.30 to 1.30, and from 2.30 to 5 p.m., was rather severe. The papers as a whole attained a very high standard, but the amount of statistical material and the frequent recurrence of percentage valuations and quantities were surprising. Indeed a small clinical paper by Dr. Ross, of Winnipeg, was a welcome change from the others.

The value of taking the blood-pressure throughout the operation was ably insisted on by Dr. McKesson, and I found that a great many men regularly took blood-pressure readings throughout a long case, holding that they thus obtained a very valuable index of the patient's condition, and that by keeping the chart they were able to prognosticate the occurrence of shock far earlier than by the other clinical signs. Moreover, they assured me that in a very large proportion of cases if the blood-pressure remained low for half-an-hour, and even though the patients left the table alive, nearly all died within a few days. This was a very important point, and I subsequently found that these anæsthetic charts were actually used and carefully compiled. (Chart shown on screen.)

The following is the description sent me by Dr. Bourne of what he calls "Third Degree Shock":—

BLOOD-PRESSURE INTERPRETATIONS IN TERMS OF CIRCULATORY DEPRESSION.

"First degree circulatory depression is that in which there is a 15 per cent. increase in pulse-rate without change in blood-pressure, or a 10 per cent. decrease in blood-pressure without a decrease in pulse-rate.

"Second degree is that of increase of 25 per cent. pulse-rate along with a 10 to 25 per cent. decrease in blood-pressure.

"Third degree, which may be known as shock definitely, is that in which the pulse-rate is 100 or more and ascending, accompanied by a rapidly falling blood-pressure

reaching that of 80 mm. of mercury systolic and 20 pulse-pressure or less. This is commonly known as the McKesson interpretation of the practical application of blood-pressure findings, and I have found it very practical, so much so, that the anaesthetist can warn the surgeon of oncoming shock with much finer detail than by simply observing the quality of the pulse by the sense of touch. For example: with the onset of second degree circulatory depression as graphically represented on a chart, one can be on the close look-out for its approach towards third degree depression and then it is that you definitely warn your surgeon that the patient is being shocked. If this third degree depression remains for much longer than fifteen to twenty minutes, it seems to me almost absolutely prognostic that that patient will surely die.

"I also find that in taking frequent blood-pressure readings one concentrates more on what one is doing. That is to say, one seems to have the situation better in hand than otherwise."

The consensus of opinion at this Congress was in favour of gas and oxygen, or gas, oxygen and ether as the anaesthetic of choice; failing that, open ether, or ethyl chloride and ether. Only once did I hear chloroform extolled, and that was at Boston, by a doctor practising in some far-off place where it was not easy or convenient to obtain gas and oxygen.

During the conference I was honoured by my appointment to the honorary chairmanship of one of the sessions. In the course of the Chairman's Address I alluded to the recent work of Dr. Mackenzie Wallis and Dr. Hewer on ethanesal; this aroused much interest, and my remarks on this subject had to be repeated subsequently before the Nose and Throat Section of the Ontario Medical Association.

I had not intended to go to Boston, as I wanted to see the work of the Mayo Clinic; but as I was assured that all I would see there would be open ether, I decided to go on to Boston.

The morning after my arrival at Boston I was taken by Dr. Hapgood—a leading anaesthetist there—to the Massachusetts General Hospital, where I saw Dr. Tobey operating on tonsils. He operates with the patient in a sitting posture. The anaesthetic given by a nurse was gas and oxygen, followed by ether given by a pump and suction apparatus, which I have mentioned before. Here I observed a very fine type of gag, which gave a better exposure of the tonsils than I had ever seen before, and which combined spatula and gag in one instrument. I subsequently bought one of these gags, and they are now obtainable here in London.

We next went on to the Boston City Hospital, and I saw anaesthetics given by Dr. Richardson, also for tonsil operations. Here open ether was given in the sitting posture. Dr. Richardson said he usually gave gas and oxygen first, but that his machine for doing this was temporarily out of order. He did not use the sucker, but in order to get rid of the blood the head was pushed forward directly the tonsils had been taken out. Here the anaesthesia was maintained by nasal tubes and the ether blower.

We went into another theatre in this building to see Dr. McKesson carry out his method of secondary saturation. He anaesthetized a young woman who was to have her knee opened. She had no preparation at all. McKesson began to get her under, and I noticed that her face was getting a curious gray colour, and that her breathing was becoming shallower, with a little prolonged expiration. Suddenly I heard a noise in the machine, and I realized Dr. McKesson was giving oxygen under considerable pressure, so much so, that the patient's cheeks were blown out beneath the facepiece. Gradually she regained her colour, and he said, "That is primary saturation." As soon as she became pink, he proceeded to saturate her a second time, and the same

process was gone through. I must admit that the anæsthesia was very fine afterwards; he obtained good relaxation with it. I doubt whether we have a machine in this country which would be capable of giving oxygen under the pressure he delivered it. I asked him subsequently whether this was a method one could teach students. He was perfectly candid about it; he said "No, it is a method for the expert, and for the expert only." He added, "You can do it perfectly well if you want to; I have done it for twelve years, and I believe in it."

After these demonstrations I attended a dinner of the American Medical Editors, where I met Dr. Henry O. Marcy, who was 86 years old. He had been a pupil of Lister's, and when he heard I came from St. Bartholomew's Hospital he said that years ago he was going round with the late Sir James Paget, and Paget asked him to show them how to give ether—they had had an accident under chloroform—and as a result he gave the first ether that had ever been administered at St. Bartholomew's. At that dinner I was asked to speak, and the subject was that of qualified anæsthetists or unqualified anæsthetists and the teaching of anæsthetics.

On the final day of the Congress at Boston, and directly following my paper, the following resolution was proposed and carried: "That the thanks of those in attendance at this meeting be extended to the Royal Society of Medicine, of England, for having sent to this meeting an official representative in the person of Dr. H. E. G. Boyle."

I next proceeded to Toronto and the day after my arrival I went over the Toronto General Hospital, which is the best hospital building I have ever seen. Attached to the hospital is a block of 150 beds, with three operating theatres; this block is reserved for private patients of the staff. Here it was that I saw most of the anæsthetic work in Toronto. Dr. Johnston, as head of the anæsthetic staff, has a wonderfully arranged service. He has eight assistants, and he so arranges their times in the theatres that they all have a chance of showing the various surgeons how good is their work. Johnston himself only gives anæsthetics in the non-paying part when there is some case of unusual difficulty or danger.

The private anæsthetic work in Toronto is run on ideal lines: the anæsthetist goes to the hospital at about 8 or 8.30 a.m., has every convenience at hand, administers anæsthetics to the cases under operation, and the rest of the day is at his disposal. It is only occasionally that the anæsthetists have to take out their own apparatus, and then only to private houses, or to outlying districts.

In Toronto Dr. Johnston uses gas oxygen and ether, open ether, and occasionally C.E. Most of his assistants do the same. I saw one of them, however, using Dr. Shipway's apparatus. The anæsthesia in Toronto is of a high standard, and Dr. Johnston has an able first assistant in Dr. Tom Hanley.

I rather think that before long the University of Toronto will give a lead to the world in establishing a Chair of Anæsthetics.

My next visit was to Montreal where I got through much work in a very short time. Dr. Bourne showed me some work he was doing at the Western Hospital. He was giving gas and oxygen, and intratracheal ether for some tonsil enucleation cases; it is the custom in Montreal to use that method for throat work. The next case, at my suggestion, he did with endopharyngeal ether.

Next morning at 8 o'clock I went to the Victoria Hospital and saw Dr. Howell

giving open ether for a gall-bladder case, and taking blood-pressure readings all the time. His chart showing the blood-pressure, respiration, pulse, colour and state of the pupils was very instructive. I also saw Dr. Armstrong giving gas and oxygen for a case of piles, and another case of glands in the neck in which ether was being given post-nasally by a blower. The course of this case was not good as there was much blueness and salivation. At the Maternity Hospital I saw Dr. Bourne give gas and oxygen for a Cæsarean section, and again the blood-pressure chart was in evidence.

I next visited the General Hospital, where I found that the staff were very keen on spinal anæsthesia for genito-urinary work. Dr. Hepburn, the anæsthetist, appeared incredulous when I told him of some of the spinal work in London, and was frankly so when I alluded to patients being placed in the Trendelenburg position under stavaine analgesia.

On returning to New York I saw two more interesting cases. The first at the Presbyterian Hospital was that of a Wertheim operation in a woman aged 56. The preparation was as follows: 7.30 a.m., chloretone suppos., 15 gr.; subpectorally—mag. sulph., 4 per cent. = 400 c.c.; novocaine, 1 per cent. = 30 c.c. This takes twenty minutes to give. 8.15 a.m., morph. sulph., $\frac{3}{4}$ gr.; 8.30 a.m., morph. sulph., $\frac{3}{4}$ gr.; 8.45 a.m., morph. sulph. $\frac{3}{4}$ gr. The anæsthetic was administered by a nurse anæsthetist, who gave gas and oxygen, but as there was some straining ether was added for five minutes; after that gas and oxygen alone was given, and the anæsthesia appeared to be perfect for the next hour, when I left. I was told that the operation would probably take three hours.

The last case I saw was at the Skin and Cancer Hospital—that of an amputation of the breast in a woman aged 57, Dr. Egger operating. The preparation here was: Over night, two soap and water enemata; 7 a.m., tap water enema; 7.30 a.m., chloretone suppos., 15 gr.; 8 a.m., subpectorally—morph. sulph., $\frac{3}{4}$ gr.; atropine, $\frac{1}{160}$ gr.; novocaine, tablet "A"; mag. sulph. 4 per cent. = 450 c.c.; 8.10 a.m., per rectum: ether, 3 oz.; ol. oil, 1 oz.; paraldehyde, 4 dr. In this case some ether had to be added by means of nasal tubes and blower.

One or two defects in medical ethics need mention. Both in the United States and Canada the unqualified nurse-anæsthetist continues to flourish, though the anæsthetists proper of both countries are trying to confine the duty of administering anæsthetics to properly qualified medical men and women. I found a custom operative, both in the case of institutions and individuals, of employing a nurse-anæsthetist at a stated fee and then of exploiting the nurse by making money out of her work—a true example of "sweated labour." I further found that at some places they had a qualified anæsthetist at a fixed salary, but that the institution charged fees for his services in the private block, and made money out of him in this way. Neither of these practices appealed to me.

I found that, on the whole, fees for giving anæsthetics were higher there than on this side of the Atlantic, and that some of the men were making a very good income indeed. Certainly the ease and comfort with which the anæsthetic work was conducted in a place like Toronto made one envious to a degree.

My thanks are due to you for having selected me to represent you at those Congresses, thus enabling me to become acquainted with a body of men and women whose keenness for work is only excelled by their charm and hospitality.

Section of Anæsthetics.

President—Dr. H. J. SHIRLEY, C.M.G.

DISCUSSION ON THE UTILITY AND LIMITATIONS OF NITROUS OXIDE ANÆSTHESIA.

Dr. A. L. FLEMMING

said that he would avoid the question of economy and convenience as having no scientific bearing on the subject; and that having no dramatic new method and no sensational statistics to bring forward he would select his data from recognized factors which must be familiar to all anæsthetists who employed this method. To ignore the difficulties associated with the administration of gas would be to court disaster and to bring discredit upon a useful anæsthetic, and to minimize the possible dangers would be to run the risk of extolling this agent at the expense of their old friend ether which had done so much toward eliminating anæsthetic deaths occurring on the operation table.

Speakly broadly it might be said that in recent years the choice of a general anæsthetic had come to lie between nitrous oxide and ether rather than, as hitherto, between ether and chloroform. And as ether anæsthesia was now so widely understood it might be taken as a standard by which to measure the merits and demerits of gas anæsthesia.

Although in the hands of a specially skilful administrator either of these anæsthetics might successfully be used for patients of almost any age or physical condition, experience pointed to the existence of this important difference: That in the hands of an administrator of average skill ether might safely be used by itself, but nitrous oxide was rendered safe only by the addition of some other drug such as ether, morphia, hyoscine, &c. For this reason it was wiser, and indeed easier, for the student to learn by adding N_2O to ether anæsthesia than by adding ether to N_2O anæsthesia.

Concerning the physiological and pharmacological properties of nitrous oxide many facts had been established by the investigations of the late Sir Frederic Hewitt, Dr. Buxton, Professor Crile, Dr. Casto, Dr. Burge, Dr. Kemp and others. Of these the following seemed especially worth bearing in mind: (1) That N_2O exerted a specific effect upon the nervous tissues; (2) that with N_2O the motor areas in the brain remained more sensitive than with ether; (3) that it somewhat abruptly interfered with oxidation in the tissues; (4) that animals were killed by N_2O more quickly than by asphyxia; (5) that when animals were placed in N_2O their respiration gradually diminished and ceased; (6) that in animals the red blood corpuscles were diminished 25 per cent. after thirty minutes' anæsthesia with $N_2O.O_2$.

By common consent nitrous oxide was regarded as comparatively non-toxic, but in view of the above characteristics it was known that it was a very powerful drug and an indifferent relaxant, and they found clinically, as would

be expected, that correct dosage was a matter of paramount importance, and that an attempt to procure muscular relaxation without cyanosis called for the employment of oxygen in the place of air.

Many years ago, following the example of others, he (Dr. Fleming) had attempted in a series of cases to maintain prolonged anæsthesia by means of an apparatus delivering known proportions of N_2O and air, but had frequently noticed that after anæsthesia had been in progress for a period varying from five to twenty minutes a marked depression of respiration set in; some cases had shown definite outward displacement of the heart's apex and in one instance an electro-cardiographic record had been taken and the tracing was interpreted by the physiologist to indicate impending death—in none of these cases had there been marked cyanosis. The conclusion derived from the above series was that gas and air alone was not suitable for prolonged anæsthesia, and in this respect it compared unfavourably with ether.

It was worth remembering that if sufficient ether were added to gas and air a very satisfactory result might be obtained as described by Dr. Blomfield some time ago.

Nitrous oxide and oxygen given without ether or other relaxant required a high degree of skill on the part of the anæsthetist; the slightest error in technique was apt to give rise to respiratory or circulatory embarrassment which might assume alarming proportions in the presence of abnormally high or low blood-pressure; in the subjects of extreme weakness from hæmorrhage or toxæmia abdominal manipulation was especially prone to cause sudden faintness. In the speaker's practice this method had too often been followed by troublesome nausea, and disappointments had arisen through the discovery on at least two occasions, that what seemed to be a perfectly satisfactory anæsthesia was really only an analgesia, a contretemps which must be almost unknown with ether.

Available statistics did not distinguish clearly between fatalities occurring under $N_2O.O_2$ alone and those taking place under mixtures of N_2O and other relaxants, but very favourable results had been published from clinics in which alkaloids and local anæsthetics were employed to such an extent that the N_2O played a secondary part, a fact which seemed to support the view that nitrous oxide was safest when used not as the main or sole relaxant but in conjunction with other agents.

He (Dr. Fleming) had met with in his own practice (or had been told of them as occurring in that of his colleagues) some cases which might serve to illustrate certain difficulties with various mixtures of gas and oxygen and ether:—

(1) The embarrassment caused by a full stomach was seen in a child aged 10, with fractured leg. Rapid respiration and cyanosis with gas and oxygen, but normal conditions established by changing to ether. On recovery copious vomit of undigested meal.

(2) A patient with phthisis, man aged 30, was given gas and O_2 for interval appendix operation. Phthisis which had been quiescent was activated. The breathing was laboured during operation and the question arose whether forced breathing might not disturb the affected lobe, and whether ether was *per se* detrimental in pulmonary tuberculosis.

(3) A woman, aged about 50, the subject of emphysema, developed rapid respiration (sixty per minute), towards end of ten minutes' gas and oxygen administration for removal of sebaceous cyst of head. The respirations remained over fifty for two hours after operation.

As regards shock there was one class of case which was extremely disappointing and the following was an illustration:—

(4) A stout patient, aged 60, had perineal prostatectomy performed under gas and oxygen and ether. On recovery from the anæsthetic his condition was distinctly good, but three hours later shock developed and although he eventually made a good recovery his condition was precarious for twenty-four hours owing apparently to this shock.

There could be no question as to the value of nitrous oxide in helping them to combat shock, and it was necessary to find out as clearly as possible exactly how much to expect from this agent and how much from the various drugs which might be used in conjunction with it.

Dr. G. A. H. BARTON

protested against the loose way in which the term "gas and oxygen" was used by some to denote a method involving, in a large proportion of cases, the administration of ether. He had made an effort at the outset of his series to limit himself to gas and oxygen only, but he found, as he expected, too high a proportion of unsatisfactory results. Insufficient relaxation, movements, sudden and unaccountable fluctuations in the depth of narcosis, and occasionally vomiting without any apparent provocation, were the usual causes of disappointment.

He described three methods of giving the ether. (1) The spectacular, which consisted of getting the patient deeply under ether in the seclusion of the anæsthetizing room and then "carrying on" in the theatre with gas and oxygen only. (2) The more humble one of switching on ether vapour, as and when it appeared to be required during the course of the operation; a method occasionally marred by laryngeal resentment to the sudden addition of ether in a patient lightly under gas and oxygen. He was not sure that, following the lines of least resistance, the best plan was (3) to give a trickle of ether throughout. But could any of these methods honestly be called "gas and oxygen"?

He considered the method had its advantages in most operations on the extremities, and on the head and neck, provided one took the trouble to administer intratracheally. For throat operations, however, he was convinced that the depth of narcosis obtainable was insufficient to give satisfaction; and the same applied to abdominal work, unless the method were combined with spinal or infiltration analgesia.

In certain patients the method was, of course, invaluable. Such patients were those who were known to take other anæsthetics badly, and the subjects of diabetes, albuminuria, and respiratory catarrh. The method had been loudly acclaimed in cases of shock. Dr. Barton failed to see that gas had any influence in the mitigation of shock, and he considered the good results obtained were due rather to the morphia, to the oxygen, and perhaps to the ether associated with the method.

In early days he had been accustomed to use the original apparatus devised by the late Sir Frederic Hewitt, a rather cumbrous contrivance, which he abandoned in favour of Weiss's oxygen attachment. If it was desired to give ether it could be easily adapted to a Shipway apparatus in such a manner that the oxygen could be passed in any proportion desired through the ether, the chloroform bottle being eliminated. He always used this in private work, and preferred it to any other apparatus on account of its simplicity and portability. During the past year in his hospital work he had given an extensive trial to

Mr. Boyle's apparatus. He had found this a little disappointing, mainly owing to constructional defects for which Mr. Boyle was in no way responsible. In the design, however, he criticized the spirit lamp, which he regarded as dangerous, and the sight-feed, in his view, an unnecessary addition.

Mr. BOYLE

said that he would discuss only a few of the points mentioned by Dr. Flemming. He was certain that the proper administration of the nitrous-oxide-oxygen-ether combination required much skill and constant practice; but when once the method had been mastered the administration should become quite easy. It was, however, a great mistake to suppose that anyone could give a good nitrous-oxide-oxygen-ether anæsthesia, for its administration required both care and experience.

As far as concerned the administration of anæsthetics by the average man, who probably only gave a few during the year, he was convinced, as he had often said before, that ether should be the anæsthetic of choice. It was not fair to expect a house surgeon or in some cases even a resident anæsthetist to be necessarily a skilled administrator of the nitrous-oxide-oxygen-ether combination. Dr. Flemming had asked for his views of the quickness of induction. He always tried to make induction as short as possible, as, from personal experience of taking anæsthetics himself, he thought the period until consciousness was lost was quite the most unpleasant, and so he tried as far as possible to reduce this to a minimum for his patients.

As to the question of giving ether in conjunction with the gas and oxygen, he saw no reason why this should not be done in those cases in which it was indicated, and indeed he usually did this. It was a mistake to speak of the method as gas and oxygen—rather let it be called, as he had called it, a combination of gas-oxygen-ether or gas-oxygen-CE as the case might be. When this combination was properly used it was really surprising to see how little ether or CE was needed even for prolonged cases.

With regard to gas-oxygen with ether or CE for tumours of the neck, he could only say that he had used it for several goitre operations with excellent results, and felt that a quiet induction with gas and oxygen was less likely to engorge the throat and cause respiratory difficulty than a rash administration of ether.

As far as shock was concerned, in his experience there was less shock after this combination than after ether or chloroform.

To provide relaxation he preferred to rely on ether or preferably CE, but he must remind the members that he had seen Dr. McKesson do his secondary saturation, which produced excellent relaxation, though personally he did not think that he was going to try the method at present.

Mr. CHALDECOTT

expressed disappointment that Dr. Flemming had made only a casual reference to the method of using local anæsthesia in combination with continuous gas and oxygen. He (the speaker) had used this combination in a great many cases since its introduction by Crile in 1913, and in his opinion it was the only method of using gas and oxygen which produced ideal results in abdominal and other serious operations, viz., satisfactory relaxation during the operation and a minimum of discomfort afterwards. It was indisputable that the muscular

relaxation and absence of shock were due to the nerve blocking, and that the N_2O did little beyond keeping the patient unconscious. For this reason he deprecated the use of continuous gas and oxygen *by itself* for abdominal work, but he agreed with Dr. Flemming that in operations other than abdominal it was an excellent plan to induce anæsthesia with gas and ether, and then carry on with gas and oxygen, thereby minimizing the quantity of ether inhaled. He had for some time taught this to students as a routine method in suitable cases. He was of opinion that the kind of apparatus used was of little consequence, but in teaching he always made students use an ordinary Clover's gas and ether apparatus with an extra tube attachment for oxygen, as the simpler the apparatus the less was the student's attention diverted from the patient.

In desperate cases he would not employ gas and oxygen except in combination with nerve-blocking. In the absence of local or regional anæsthesia he would prefer ether to unaided gas and oxygen.

Mr. H. M. PAGE

said, in answer to Dr. Barton's question as to the water-feed system, that he had had a very considerable experience in the use of the water-feed and non-water-feed apparatus. For the cases he reported in the paper read before this Section in 1913,¹ he used either the Teter apparatus or some other of that kind; since then he had been using a water-feed apparatus and he would be very sorry to give it up. In his experience a skilful administrator could do a good deal with improvised instruments, but much better and safer work could be done by the use of one of the instruments designed for the purpose. Dr. Boothby invented the first water-feed apparatus, which he demonstrated at the West London Medico-Chirurgical Society in 1912. Dr. Gwathmey and Dr. Wolsey designed a smaller and more portable apparatus on his principle and during the war Mr. Boyle, Dr. Marshall and Dr. Shipway brought out modifications of Gwathmey's instrument. Dr. Flemming had raised some very interesting and important questions in his opening paper. In his paper referred to above Mr. Page advised that anæsthesia should be induced by a mixture of nitrous oxide, oxygen and ether, after which it would often be found that no more ether need be added during the operation, and in the same paper he had urged that recourse should always be had to the addition of ether when any difficulties occurred during the administration, and that no effort should be made to overcome these difficulties by pushing the nitrous oxide; and that this was the way to safety.

In his opinion every bit of ether vapour saved by the safe addition of nitrous oxide, even if given intermittently as recommended by Dr. Flemming some years before the war, improved the after-operation condition of the patient.

Dr. SHIPWAY

said that many of the points which Dr. Flemming had raised required a physiological explanation, and it was to be regretted that there was no physiologist present who could help them in elucidating those points. The most important were raised by those cases which he had described as showing alarming symptoms under gas and oxygen, or which he had quoted from the

¹ *Proceedings*, 1913, vi, p. 27.

literature as having suddenly ended fatally without any very obvious cause. The explanation of these was to be found in Haldane's writings, who had pointed out the disastrous effects of acute or long-continued anoxæmia upon the respiratory centre. This centre was more quickly or more certainly paralysed by oxygen-want than was the heart. It would appear that some of these cases which had been reported as being in "good condition" or showing a "good colour" before they suddenly died, had been in reality slightly starved of oxygen for an unduly long period, and had died of failure of respiration. Supporting this view clinically was the fact that quite slight changes of colour were not always easy to detect, and that there would seem to be some difference of opinion as to what exactly constituted a "good colour" in a particular patient. Again, it was known that the ordinary methods of resuscitation, including cardiac massage, had been unavailing. Believing this, it was his practice when handling a difficult patient, to increase the oxygen supply and to add a little ether to maintain anaesthesia, rather than to persist with gas and oxygen alone. This anaesthetic was contra-indicated in cases of high blood pressure and arterio-sclerosis; the latter condition, especially, was apt to give one some anxiety, as it was extremely difficult to maintain a proper colour. Diabetes did not, in his opinion, contra-indicate gas or oxygen, although a physician, who had had much experience in this disease, had told him that he thought it should never be used. Presumably, he dreaded an asphyxial element. It was not suitable for active or recently-healed tubercle of the lungs; the rapid and deep breathing which it promoted was likely to lead to a spread of the disease or to a fresh breaking-down. They must follow the lead of the sanatorium experts, who kept these cases at rest until the disease was quiescent, and forbade any severe exercise until a considerable period of freedom from active disease had elapsed. Gas and oxygen was undoubtedly the best general anaesthetic in shock and for preventing shock. Dr. Flemming did not seem to be convinced upon this point, but the evidence from the Casualty Clearing Stations in France was overwhelmingly in its favour, and the work of Dale upon histamine was also extraordinarily suggestive.

Section of Anæsthetics.

President—Dr. H. J. SHIRLEY, C.M.G.

Anæsthesia in Intracranial Surgery.

By Z. MENNELL, M.B.

THE administration of anæsthetics for intracranial operations presents problems which differ in many and essential respects from those concerned with the induction and the maintenance of anæsthesia for operations elsewhere, as both the disease for which the operation is performed, and the operative manipulations, have a direct and often a very profound effect upon the medullary centres.

These centres are accustomed to adapt themselves easily and efficiently to the normal variations of intracranial pressure. The adaptations rendered necessary—if life is to be preserved—by gross changes of pressure impose a strain upon the compensatory mechanism which may readily enough be borne when those changes are brought about slowly, but which may cause a fatal breakdown if they occur suddenly or rapidly. The anæsthetist must be familiar with these different phases if he is to maintain anæsthesia with confidence and safety during an intracranial operation.

My experience of this special work, on an extensive scale, began with the late Sir Victor Horsley, for whom I had the advantage of giving some hundreds of anæsthetics. Horsley had his own ideas about anæsthetics and the methods by which they should be employed, and although I have now completely abandoned these methods, I am bound to remember with gratitude the physiological reasoning on which they were based. They were undoubtedly well adapted to his peculiar methods of operating.

In the first place he insisted upon the employment of chloroform, as being associated with less hæmorrhage, particularly when administered in combination with abundant oxygen, the latter diminishing venous pressure and consequently minimizing the amount of blood lost from veins and capillaries. To this, and to his extraordinary rapidity, he trusted for a minimum of bleeding rather than to the more painstaking and therefore necessarily slower means of securing hæmostasis adopted by other surgeons. Recognizing the danger of overdoses of chloroform, he insisted upon the employment of the least possible quantity, sufficient only, indeed, to keep the patient still enough to allow of the performance of the operation. For this purpose a special form of the Vernon-Harcourt inhaler was devised, its aim being to supply to the patient air or oxygen charged with a known percentage of chloroform vapour which could be increased or diminished at will as the various steps of the operation demanded a more or a less profound degree of anæsthesia. For some years from 1906 onwards I employed this Vernon-Harcourt apparatus at the National Hospital, following the practice of Dudley Buxton and Powell at that hospital. This apparatus was shown by Powell at the old Society of Anæsthetists and was criticized rather severely by the members. This criticism was met by Dr. Buxton, Powell and myself and we were then all in favour of its use. Now, however, I never use chloroform for a head case, and I will indicate the various methods which I have successively employed, and my reasons for believing that my present practice is best.

In addition to the special dangers mentioned, special difficulties are also encountered in this class of work. The position of the patient which the operation demands, and the necessary covering up of the face with towels

obligatory, for example, in the modern pituitary operation, interfere with a free airway; this adds to the difficulties which may already exist owing to interference with the respiratory centre, whether by reason of the general intracranial pressure or of the situation of the lesion to be attacked. All these difficulties and dangers are at a maximum in operations for cerebellar tumour or abscess. When chloroform is used the anæsthesia must be extremely light, so much so that it was customary at the National Hospital for a male nurse to be allotted for restraining the patient's movements, not only when the sensitive skin was being dealt with at the beginning and end of the operation, but often throughout its whole duration.

I believe the explanation of the great danger of chloroform in cerebral surgery to be as follows: Owing to the comparatively small flow of blood through the brain when the intracranial pressure is much raised, a higher percentage of chloroform in the blood is necessary in order to secure anæsthesia than when the intracranial tension is normal. Directly the pressure is relieved by the opening of the dura, an enormous increase at once takes place in the volume of blood flowing through the brain, so that a dangerous and even lethal dose of chloroform suddenly bathes the medullary centres. That something of this nature occurs is evident, as the depth of anæsthesia undoubtedly increases directly the dura is opened, and this applies to all the anæsthetic agents which I have used. This explains Horsley's rule "no more chloroform when the bone has been removed," and also his great objection to snoring as indicating too great a depth of anæsthesia. There is no need to emphasize the advantage which other anæsthetics have under such conditions over chloroform in ensuring a much greater margin of safety.

With chloroform the lightness of the anæsthesia, the continual alarms associated with it, the frequent changes of position, and the occasional necessity for resorting to artificial respiration were not conducive to good surgery. After all proper hæmostasis is the business of the surgeon, who should depend less upon the low blood-pressure of chloroform narcosis and rapidity of operation to minimize loss of blood than upon the deliberate arrest of hæmorrhage as it arises. The deeper anæsthesia compatible with safety which ether offers, led me next to adopt the following method: Having induced anæsthesia with chloroform up to the point of muscular relaxation, I substituted ether for chloroform, still using the Vernon-Harcourt inhaler, at the same time using a plentiful supply of oxygen; there was, however, free salivation, as at this time atropine was not used to any extent before operation. Morphia was never given on account of its depressant effect on the respiratory centre. I often used this method when working for Horsley without adverse comment from him, and certainly scares were of less frequent occurrence.

Later, again, I used ether in a Junker's inhaler, to which I attached an oxygen cylinder, the tube of the Junker passing under the towels and leading to an ordinary Junker mask. This cannot be called open ether, as there is a very considerable amount of rebreathing under towels wet from the constant irrigation.

The mechanical difficulties of administering any anæsthetic by inhalation, however, were such as to lead me to take up infusion anæsthesia. At first ether was employed in this manner, but I soon abandoned it in favour of hedonal.

In 1912, I published an account of fifty-six intracranial operations done under hedonal anæsthesia; at the International Congress of Medicine in 1913, a further series of twenty-nine; and I have records of another twenty-seven given since that time, making in all 112. Personally, I had no trouble with hedonal when used in these cases, but the technique was very tiresome, it was expensive, and when used for general surgery was open to considerable adverse

criticism, chiefly owing to faulty technique and its use in unsuitable cases, such as operations about the air passages.

Among these 112 cases, only one death occurred within twenty-four hours after operation, and that could not be properly attributed to the anæsthetic. When the war came, hedonal, which was a German product, was unobtainable, so that its use came to a sudden end. I tried alcohol infusion in nine cases.

Although naturally the use of infusion anæsthesia did not do away with the necessity of maintaining a free airway and keeping the blood properly oxygenated, its utility was obvious on account of the possibility of maintaining a quiet anæsthesia for a long time with safety to the patient and convenience to the surgeon. It also impressed upon me the value of knowing the blood pressure at the various stages of the operation in estimating the patient's condition. I have blood-pressure records, taken at regular intervals during the operation, of nearly all these cases. A word of warning is necessary in this connexion. The artificial and transitory raising of the blood-pressure by the constant supply of fluid during the operation might be a source of danger in leading to a false estimate of the patient's condition.

From infusion anæsthesia, I passed on to intratracheal ether which I had been using for some time in other types of work. At first I only used this method intermittently during the war, but for the last few years I have been using it for all cerebellar, pituitary and high spinal cases, and I consider it to be of the utmost value, if not a necessity, in many such. By this method a perfectly safe, quiet, and prolonged anæsthesia can be obtained. The patient can be placed in almost any position; in cerebellar cases, for instance, a degree of flexion of the neck can be obtained which would be impossible with any other method of anæsthesia. Once the patient is in position and the operation is begun, the anæsthetist can be completely out of the surgeon's way, and is free to make blood-pressure and other observations. When, as is usually the case, constant saline irrigation is employed, there is no danger of drowning, since there is complete absence of inspiratory movement. The surgeon, assured that no sudden fall in blood-pressure will occur so long as he controls hæmorrhage properly, can carry out the operation without haste, and can in all but a very few instances, complete even the most formidable cerebral operation at one sitting. The objectionable two-stage operation has almost entirely disappeared.

The comfort with which cerebellar, occipital and high cervical operations can be conducted, makes intratracheal ether the ideal anæsthetic from the surgeon's point of view, and it is no less advantageous from that of the patient when safety during the operation and comfort afterwards are considered.

One of the most embarrassing accidents which may occur during an intracranial operation is vomiting, which leads to protrusion of the brain and venous hæmorrhage. Vomiting can more certainly be avoided and more easily controlled by the intratracheal than by any other method.

With *temporal* and *parietal* operations, there is less necessity for the employment of the intratracheal method, and in these cases I often give ether and oxygen by means of the Junker inhaler. When using this method in these cases I always keep one hand on the jaw, and so can feel any attempt at swallowing, which I regard as the call for a slight increase in the strength of the ether, any rapid increase causing vomiting. I frequently stop the anæsthetic and simply allow oxygen to run through the by-pass until this early swallowing occurs. I judge of the patient's condition by the blood-pressure and pulse, a quickening of the pulse always preceding a fall in blood-pressure. The colour of the blood can be seen in the operation wound and in the nails of

the hand. When the blood-pressure falls, in these cases frequently from loss of blood, less anæsthetic must be given, but I regard this fall as inevitable when the dura is opened and at the same time anæsthesia deepens. I always regard the sagging away of the brain from the skull of serious import when associated with an increasing pulse. This fall in some cases may come on very rapidly, and the pulse disappears at the wrist; pulsation can, however, be seen in the brain and can readily be brought back at the wrist by applying gentle pressure to the brain. I do not regard stimulating drugs of any value in such a condition, but after the flap has been replaced, if the blood-pressure continues low, I give large doses of camphor and if necessary, gum-infusion of one pint or less, never more, as this additional fluid seems to render œdema of the brain a more common sequela to operation. This I believe to be the greatest argument against an infusion anæsthesia.

Frontal lobe tumours rarely cause difficulty, as this lobe is now explored by means of glass retractors through a temporal opening. But when it is necessary to raise the frontal lobe for exploration of the pituitary fossa, the incision is carried through the eyebrow, and intratracheal anæsthesia becomes practically a necessity. In such cases, when the frontal sinus is opened, blood and irrigating fluid are liable to cause trouble by collecting in the nasopharynx, unless an intratracheal catheter is used.

Cushing's position, namely, with the patient completely prone, the forehead being supported on an outrigger, is now seldom adopted for cerebellar operations; when it is used I tie the intratracheal catheter to the teeth and, with a dental prop in position, never have any trouble with the air-way. Mr. Sargent and Mr. Armour now employ a semi-prone position with extreme flexion of the neck, which makes the administration of the anæsthetic by any other method almost impossible, as the point of the chin is jammed on the chest and a sand-bag placed directly under the chest and axilla. A mechanical airway is useless, as the anæsthesia must always be kept too light for one to be tolerated.

When a tumour has to be removed from the cerebellum or lateral recess, serious trouble should always be anticipated. Direct disturbance of the medullary centres is liable to occur, and a transitory severe fall in blood-pressure almost always occurs. I have often noticed the radial pulse disappear completely while the surgeon is exploring the lateral recess, and return directly this exploration has ceased. In these cases the added danger attending the use of chloroform is apparent, and, when it was employed, resort to artificial respiration was commonly necessary. But I have had no such difficulty when using intratracheal ether, and the method now used by Mr. Sargent of removing these tumours by means of a suction apparatus, after they have been broken up within their capsule, greatly lessens the dangers. In these cases the falling away of the brain from the skull is a poor guide as to the condition of the patient, for when there is a high pressure the ventricle is usually tapped in order to render access to the lateral recess more easy. The risk of these cerebellar operations is very serious, and unless the anæsthetist has had considerable experience of them, the patient's condition may appear so desperate that the anæsthetist may be tempted to stop the surgeon unnecessarily. The radial pulse may be impalpable for as long as twenty minutes without any serious harm resulting; the patients usually recover quickly and show no bad effects. The depth of anæsthesia is extremely important; the lighter it can be kept the better, but it must be deep enough to prevent any possibility of movement or of vomiting during manipulations so close to the medulla. In these cases I do not myself use the corneal reflex in estimating the depth of the anæsthesia, but to those who do, it may be well to point out that a

diminished or absent corneal reflex on one side may constitute one of the symptoms of the lesion for which the operation is being done.

Such delicate operations as trans-ventricular removal of basal tumours and removal of the choroidal plexus for hydrocephalus call for most careful work, especially in babies; for adults I use the intratracheal method, and for infants I give ether through a Junker inhaler with a by-pass.

Gasserectomy I now rarely see, as the operation of division of the sensory root of the fifth nerve has replaced that of removal of the ganglion. In a difficult case the operation may be very tedious, and as the patients are almost always elderly people with diseased arteries, special care is necessary, and it is not advisable, if any symptoms of shock appear, that the operation should be continued. The patients are usually bad subjects, and are frequently broken in health by pain and drugs.

Here I will refer to the injection of alcohol into the various branches of the fifth nerve for the relief of trigeminal neuralgia. For some years I have been using a light chloroform anæsthesia, and the method I adopt is the following: I first insist on silence in the room throughout the whole procedure, and then induce in the ordinary way with a mask whilst talking to the patient. I tell him that his pain will soon be better if he will go on breathing in and out, and that he will soon go off. Directly anæsthesia has been established I remove the mask and let him come round, talking to him the whole time, and when the needle is exploring for the foramina, ask him if he has pain, repeating what I said when inducing. He will always react when the needle finds the nerve, and in a favourable case will almost tell the surgeon when this occurs; it may be even possible to tell whether anæsthesia of the skin has been produced. I then give more chloroform when the injection is over, talking in the same way, and again produce anæsthesia. This has the effect of blotting out all recollection of the injection, and any sensation of pain afterwards. No one else should be allowed to speak at any time during the operation, and my only failures to blot out memory have been due to the non-observance of this essential rule, when the patients have remembered the operator remarking he has found the spot.

A word of warning may be given as regards the eye. The corneal reflex is abolished, or, at any rate, the cornea becomes less sensitive when the injection is successful; great care must therefore be taken in testing for this reflex, as the cornea may be easily damaged and ulceration result. A lubricant must always be put in the eye after the injection is over.

When a tumour is removed from any part of the brain, there is usually a considerable degree of shock, partly from bleeding, which is sometimes severe, and partly from direct trauma. This is counteracted by the use of a plug to take the place of the tumour, and gentle pressure applied with the hand outside.

A common operation since the war has been the repair of a bony opening. As the dura is not, as a rule, opened during this operation, from one point of view it calls for no special comment. With high cervical laminectomies many of the advantages attending the use of intratracheal ether in cerebellar operations are present, with the additional advantage that the dura can be more easily opened without injuring the arachnoid, in the absence of respiratory movements. Cushing's cerebellar position is often adopted in these cases.

A large experience of anæsthetics for tumours of the brain cannot fall to the lot of many, since the cases operated upon at any general hospital are comparatively few in number. I have been singularly fortunate in having had the opportunity of giving a large number of these interesting anæsthetics. Since the Armistice I have given for Mr. Percy Sargent alone no fewer than seventeen anæsthetics for pituitary tumours, forty-nine for cerebellar, and

sixty-three for supratentorial tumours. These are tumour cases only, and are in addition to many others for simple decompression, repairs, hydrocephalus and other conditions.

It is upon the experience of these cases, compared with those in which, before the war, chloroform or hedonal were employed, that I unhesitatingly choose ether at the present time as the best anæsthetic for employment in cerebral surgery.

I have brought for exhibition the intratracheal apparatus which I use. I claim nothing original for it. The machine is easily portable, and the motor will run on any constant or alternating current from eighty to 200 volts—as well on the Paddington alternating current as on the Marylebone constant or country house private installation. It has run for eighteen hours on end without getting hot.

I also show the two-way stopcock I use when giving ether and oxygen. There is no need to warm the vapour, as the tubes are long, and the temperature of the vapour is that of the theatre by the time it reaches the patient.

One of the main objects to be aimed at is that of giving a constant dose, and in these cases especially, the minimal dose which is compatible with efficiency. Any change in the strength of the vapour must be extremely gradual. A free air-way, a plentiful supply of oxygen, and a very close co-operation between the surgeon and anæsthetist are essential.

DISCUSSION.

Mr. PERCY SARGENT said that he was convinced that it was the variations in intracranial pressure which constituted by far the most important factor during operations for cerebral tumour. The brain was singularly tolerant of changes of pressure provided that they were brought about gradually. Naturally the rapidity of such changes could only be controlled during an operation within certain limits, so that the effect upon the medullary centres was always somewhat brutal, and this had to be reckoned with by the anæsthetist. The need of close co-operation between surgeon and anæsthetist was perhaps of even greater moment in cerebral than in any other class of operations.

Mr. H. E. G. BOYLE said that he had had some experience of anæsthesia for cranial surgery, though not comparable with Dr. Mennell's, and he agreed that endotracheal ether was probably the best for the majority of the cases, especially the occipital and high spinal cases, but had Dr. Mennell tried endopharyngeal ether for any of his cases? He (Mr. Boyle) thought that endopharyngeal ether or, better still, endopharyngeal gas-oxygen-ether, gave exceedingly good results, and obviated the necessity for the endotracheal method; he had found that in such cases as sub-temporal decompression the combination of gas-oxygen-ether had surprisingly good effects, for after the bone had been cut away, it was nearly always possible to continue the anæsthetic with either gas-oxygen and sometimes, as Dr. Mennell had said, with a little oxygen or oxygen-ether.

Mr. C. H. MOTT asked Dr. Mennell whether he used a catheter of any smaller size than he would for abdominal operations, whether he kept the pressure extra low, and also whether he had tried ethanesal for these cases.

Dr. IVAN MAGILL asked whether Dr. Mennell could show some of the blood-pressure records taken during the course of the anæsthesias described.

Dr. MCCARDIE asked whether Dr. Mennell used the sitting-up posture for operations on the Gasserian ganglion: also whether he thought that atropine caused increase of venous oozing in brain surgery: and whether there had been any cases of lung trouble after the intratracheal anæsthesia.

Dr. MENNELL, in reply to Mr. Mott, said that the catheters he used were Nos. 22, 23, 24; that the blood-pressure was kept between 5 and 15 mm. Hg; and that he had used ethanesol, and in general surgery as well, but had now given it up. In answer to Dr. Magill he said that blood-pressure records had been published in the Medical Society's *Transactions* and in those of the International Medical Congress. In reply to Dr. McCardie's questions he said that in operations on the Gasserian ganglion the patient's head was propped up vertically on sand bags; increased venous oozing was not noticed; and that no lung trouble had occurred in head surgery in his own experience.

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Section of Balneology and Climatology.

President—Dr. G. L. PARDINGTON.

Discussion on the Place of Baths and Health Resorts in Gynæcology.

Dr. LEONARD BOYS (Woodhall Spa)

said that the treatment at Woodhall consisted in giving the bromo-iodine baths at a neutral temperature, and including douches of the bromo-iodine water and of varying force at gradually increasing temperatures. The cases most commonly treated and which gave the best results were those in which there was congestion of the pelvic organs, or in which there had been inflammation with incomplete resolution. Sterility, especially when due to such causes, had been thus treated, in some cases with the happiest results. Subinvolution, menorrhagia and dysmenorrhœa might all be relieved by the same method of treatment. Fibroids occurring in those nearing the menopause were sometimes reduced in size and the hæmorrhage kept under control. A possible explanation of this result might be that the cervix was relaxed and somewhat dilated by the douche, causing reflex contraction of the body of the uterus. Leucorrhœa, vaginitis and cervicitis were all frequently successfully relieved. Pelvic neuralgia associated with dyspareunia, and inflammation of the appendages, might often be cured by this form of bath treatment.

Dr. LIONEL CALTHROP (Harrogate)

said that though the value of the treatments which were available for diseases of women at spas had been established for many years, they were not yet sufficiently recognized by modern gynæcologists as affording an often useful alternative form of treatment. He had had experience of dealing with such cases at three British spas—viz., Droitwich, Woodhall Spa, and Harrogate. His conclusions were based on the results obtained in over 250 cases, the majority of which had been treated at Woodhall Spa. He corroborated the statements which Dr. Boys had made with regard to the benefit which patients had derived from undergoing a course of combined baths and douches by the method adopted at Woodhall Spa—a method difficult, if not impossible, to carry out at home. Whatever their theories might be as to the therapeutic action of baths and douches, or other forms of bath treatment, the actual results obtained had, in a large percentage of cases, been entirely satisfactory.

The nature of the conditions treated included congestive and inflammatory diseases of the vagina, uterus and adnexa, functional disorders such as amenorrhœa, menorrhagia, dysmenorrhœa, sterility, leucorrhœa, endometritis, subinvolution, &c., perimetritis and parametritis, fibromata uteri. Cure or definite benefit was generally effected.

2 Porges: *Baths and Health Resorts in Gynecology*

It was the fact that a course of baths and douches, as carried out at Woodhall Spa, however apparently unsuitable to and contrary to the modern theory of the action of such baths, had relieved the distressing symptoms of fibromata, in innumerable cases, by checking menorrhagia, reducing the size of the growths, and relieving the pressure on other organs. This fact was borne out by the result of 41 cases so treated by him (Dr. Calthrop). In fibromata and other uterine conditions immediate surgical treatment might be unsuitable and contra-indicated on account of other complications. In these and similar circumstances a more favourable condition of the parts might result from a course of mineral or mud baths before surgical treatment was carried out. He had seen more than one case in which a course of baths and douches had effected a complete cure of hæmorrhage and discharge, when curetting alone, though repeated more than once, had failed.

He also drew attention to the value of baths of indifferent temperature in those conditions of neurasthenia, tachycardia, or insomnia, which so often complicated gynecological disorders. Other factors of spa treatment, such as the drinking of mineral waters, regular outdoor exercise, change of air, and rest from domestic cares, were efficacious in relieving the bowel stasis commonly associated with uterine troubles, and generally toning up the patient's system.

Though Woodhall Spa was perhaps the one British spa where special facilities were afforded for the treatment of gynecological cases on account of the character of its mineral water, treatments of a like kind were being carried out at Harrogate, Bath and elsewhere.

Dr. MAX PORGES (Marienbad)

said that at Marienbad their experience of spa treatment for gynecological cases had been almost entirely derived from the use of mud baths. The cases suitable for bath treatment consisted of simple chronic inflammatory conditions; acute and sub-acute affections ought not to be treated by hot baths or douches—especially not by mud baths. Frequently febrile relapses ensued if either treatment were started too soon. On the other hand, it was sometimes really amazing to see huge hard exudations softened and dissolved in a very short time; also to see severe leucorrhœa disappear, or a greatly enlarged uterus become reduced to normal size after a course of fifteen to twenty baths.

The efficacy of these baths could be reinforced by local mud compresses and by the use of a bath speculum; the vaginal douche, however, could not be used owing to the thickness of the mud. Temperature, density and duration of the mud bath should be carefully watched and adapted to the case.

The non-inflammatory affections of the genital tract should not be subjected to this treatment, with the exception of some climacteric troubles, in which he (Dr. Porges) had seen satisfactory results; a tendency to hæmorrhage he would regard as a contra-indication.

Another strong contra-indication for bath treatment of any kind would be neoplasm, whether malign or benign in character. There was a time when balneological treatment of myoma and fibroma was recommended, even in gynecological text-books, but his experiences and that of his friends in such cases had been unfavourable, severe hæmorrhages and very often increased growth of the tumour being the consequence of this therapy. These cases should only be treated by radiotherapy, or, if necessary, by operation.

With reference to the physiological basis upon which spa treatment was founded, he said that as a rule it was sufficient to say that the exudation had been dissolved under the influence of the baths. But how was the dissolution to be explained? Possibly a clue might be found in a paper which he had read before the Section a short time before, in which he had pointed out that there was a constant analogy between the action of the arterioles of the skin and that of the arteries of the kidneys, the so-called "consensual reaction." A dilatation or contraction of the arterioles of the skin was always followed by a dilatation or contraction of the renal arteries, so that hyperæmia or anæmia of these organs would be synchronous.

Investigations, which were still going on, seemed to prove that this "consensual reaction" also took place between the skin and the other abdominal organs, except the liver. It was easy to understand that if hyperæmia of the skin, provoked by hot baths, led to hyperæmia of the genital tract, a stronger current of blood was by this means forced through the diseased tissue, increasing phagocytosis, and consequently hastening the removal of the exudate. This "consensual reaction theory" also afforded an explanation of the relapses that occurred when cases came for treatment at too early a stage, and of the unfavourable result of the treatment on tumour-growths. The fact that the action of special baths upon the skin was far stronger than that of ordinary baths accounted for the well established superiority of spa treatment in certain gynecological cases.

Section of Balneology and Climatology.

President—Dr. A. HILL JOSEPH.

PRESIDENT'S ADDRESS:

A Retrospect of Seaside Practice after the Experience of nearly a Quarter of a Century.

By A. HILL JOSEPH, M.D. (Bexhill-on-Sea).

(ABSTRACTED AND CONDENSED.)

IT is not necessary for me to give a detailed account of the various points of seaside climatology, such as the relative purity of the air, its comparative freedom from germs, greater relative humidity, larger ozone content, and the presence in it of iodine and saline particles; this state of the atmosphere being due to the fact that, usually at least, half the environment is the sea, with the rocks and seaweed exhaling ozone and iodine, and the waves breaking on the shore and sending small particles of sea-water into the air.

It is very rarely that one is consulted by visitors or by residents as to their fitness to undergo sea-bathing.¹ There are two main reasons for this: the first being that usually only the robust indulge in sea-bathing, and the second that probably those whom sea-bathing does not suit quickly find this out for themselves; that is to say, the stimulation of the body surface by the moving water and intermittent exposure to the air is not followed by a healthy reaction, and a feeling of depression instead of invigoration results, and so they give it up. Other causes of upset after bathing consist in indulging in it too soon after a meal, or in the early morning on an empty stomach, in taking no exercise after it, such as a walk, extending the way home to breakfast. The reverse, too violent exercise, such as lawn tennis, immediately after bathing, is equally harmful. The prevalent custom of going to bathe in a bathing costume and a macintosh, and returning home in wet garments is a physiological mistake; those who indulge in this practice miss the beneficial effects of skin massage with a towel directly after leaving the water, and the after-glow does not result; besides, they do not get their walk after dressing. It is curious that more evil effects do not result from this practice.

Bathing accidents are rare considering the large number of bathers. I have attended to many who have been rescued when in difficulties. With one exception none has been seriously ill. They are usually much chilled and suffer from a mild degree of shock, from which they recover by being put to bed in hot blankets and given hot drinks. The exception was a lady who attempted suicide by jumping into the sea on a cold April night. She failed to react though wrapped in hot blankets and kept in a hot room, &c., and died of pneumonia after a few days' illness.

The question as to the class of people who should not bathe in the sea is not a simple one. The primary factors to be taken into account are the time of year, time of life and temperature of the water. A large number of people can safely bathe in a warm or enclosed swimming bath, who cannot bear exposure to the air in the sea. I have formed the opinion that the following are the classes of people who should not bathe in the open sea:—

(1) Generally, people with organic disease of any part of the body which gives rise to definite symptoms, omitting of course from the category minor

¹ During the War, however, I frequently had to decide as M.O. whether a soldier at the Cantelupe Road Auxiliary Hospital, Bexhill-on-Sea, should be allowed to bathe when he became convalescent.

disabilities of the limbs due to injuries, and the results of congenital or infantile paralyses.

(2) In particular the following:—

(a) Arteriosclerotics and other persons suffering from high blood-pressure.

(b) Those who suffer from organic or degenerative disease of the heart or lungs, with the exception of some cases of mitral regurgitation with compensation. The mere presence of a cardiac murmur is not an absolute bar to sea-bathing; it is wise, however, to forbid bathing to sufferers from aortic disease of all kinds, from angina pectoris and from mitral stenosis: (functional and other disorders of the cardiac nervous mechanism, *per se*, are not contra-indications); great discrimination is however required in selecting cases.

(c) Epileptics and those liable to fainting attacks.

(d) Those very liable to cramp. It is possible that some cases of drowning in swimmers attributed to cramp are due to the sudden onset of auricular fibrillation in sufferers from mitral obstruction or early degeneration of the cardiac muscular tissue.

(e) Most sufferers from subacute or chronic abdominal disease, especially the subjects of chronic colitis and gall-bladder infections.

(f) Those affected with renal disease of all kinds, and cystitis.

(g) The subjects of skin disease, as most, if not all skin diseases, except perhaps some of a very chronic character, are aggravated by sea-bathing. A few persons develop a dermatitis after a few baths.

Some bathers get wax in their ears whenever they bathe. Probably a superabundance of cerumen is already there and the salt water causes it to swell up into a soft mass which occludes the meatus. I incline to the opinion that accumulations of cerumen in the ear occur more frequently at the seaside than elsewhere and that they are due to the saline particles in the atmosphere irritating the ear passages. I have met with several cases of myringitis and inflammation of the inner part of the external auditory meatus following bathing. Plainly the sea-water is here a cause. Bathers prone to this affection can prevent it by inserting in their ears pieces of cotton-wool moistened with almond oil, but they should be properly instructed how to do this, as a small plug may disappear inwards and be thought to have dropped out. A piece of wool larger than that in the external meatus should be outside the meatus and continuous with that within (mushroom-shaped in fact).

Paddling is allied to sea-bathing. One sees a number of cases of abdominal upset which appear to result from paddling. The main symptoms are fever, a flushed, slightly toxic face, furred tongue, often vomiting, tenderness most frequently over the ascending colon or sigmoid, but without any muscular rigidity. These are not cases of appendicitis. A dose of rhubarb and grey powder, a saline and confinement in bed on a starvation diet usually put the children quickly to rights. These attacks seem to be a mild form of colitis with secondary hepatic toxæmia due to absorption of toxic matter from the colon. They are doubtless rightly considered to be due to the influence of the sun on the head, which is usually hatless, whilst the feet are wet and a strong breeze is usually blowing, this leading to congestion of the abdominal area. Another factor has, however, to be considered; children (and adults too) when away at the sea have their appetites stimulated by the outdoor life they lead; and they eat many things good, bad and indifferent, thus taxing their digestions; consequently before they enter the water their colon is probably congested and over-loaded.

Cases of albuminuria without casts, of the same type as those classed as postural and cyclical, are met with in young boys of from 8 to 12 or 14 years

of age in the production of which bathing may be a factor: but it cannot be assumed that the albuminuria was not pre-existent. The sufferers usually rapidly lose their albuminuria when given calcium salts, or magnesium salts if oxalates are present in the urine.

In my experience albuminuria with casts is rare after bathing or paddling. It is futile to decry paddling: but the weather conditions under which it is safe—a still, warm, cloudy day—are comparatively infrequent at the seaside in summer time. I have met with one severe case of sunstroke in a child of 4 years old in which paddling appeared to be a causal factor. The child recovered.

Children at school at the seaside sometimes get too much of it. This does not apply to the greater proportion of children who go to inland homes for their holidays. The class of cases to which I refer arises in this manner. Parents bring their young children down to the sea for their summer holidays, perhaps for several summers in succession. Finding that they are benefited by the change, when the time comes for them to be put to school, the children are left behind after a summer holiday. At Christmas and each succeeding holiday the parents come down and spend it at the sea as long as any of their children are at a preparatory or a girls' school. I have seen this happen many times. The result is that the rest of the family get an annual holiday and change of air and scene whilst the unfortunate children referred to get none and are liable to become run down, pale and anæmic.

I do not wish to imply that residence at the seaside is conducive to anæmia. My experience is quite the contrary and in accord with the generally held view. I cannot recollect having treated a single case amongst residents of definite chlorosis with flabby yellow or greenish-yellow complexion. This does not mean, however, that cases of mild anæmia are never met with; those that do occur are slight and definitely secondary to some other diseased condition, or they are seen in schoolgirls at the onset of menstruation. Menorrhagia is not infrequent amongst schoolgirls at the seaside; in some cases at least the determining factor appears to be hyperæmia or plethora, and anæmia does not result. I have met with a few cases in which metrorrhagia appears to be of another origin, namely, ovarian, and due to the proximity of the right ovary to a chronically inflamed appendix. There is pain at the periods: apparently it is the result of congestion by contiguity, or due to reflex causes.

During the last twenty years or so it has become the fashion to send patients with surgical tuberculosis to the seaside and lung cases to sanatoria, and at the sanatoria to decry the use of tuberculin. My experience has led me to form the opinion that as regards surgical tuberculosis, especially glandular cases, the prevailing practice is correct. I have no doubt in my mind that many cases of early phthisis with little or no evidence of secondary infection, little or no pus formation, and an afebrile temperature chart, do very well at the seaside, especially with the judicious use of tuberculin, at any rate during the summer time. But tuberculin is a two-edged therapeutic weapon, and great discrimination is required in its use and in the selection of cases for treatment by it. Tuberculous glands, especially, do well on it, even where there are small sinuses due to suppurating glands.

More advanced cases of phthisis appear to me to obtain benefit by change to the sea in the summer time, but I cannot recommend that patients in this class of case should live permanently at the seaside, unless they be very chronic cases with evidence of fibrosis.

I endeavoured to ascertain whether any light could be thrown on the suitability of the seaside for phthisical cases from a study of the comparative death-rates of residents at the seaside and in the country generally. I soon

found out that I was up against two difficulties: In the first place there appears to be no actual uniformity in the records of the various health resorts. In some cases the death-rates of visitors and residents could not be given separately, and in all cases the records had been grossly upset by the war. Secondly, the records received showed such a vast difference between the death-rates from phthisis in the case of the various towns along the south-east of England that no conclusion could be drawn from them. At first sight it appeared that the death-rates from phthisis were lower in the smaller and younger towns. The explanation hinted at by the Medical Officer of Health for one of the larger towns appears to me to be the correct one: that the larger and older towns contain a larger proportion of chronic and latent cases of phthisis who die after long residence. I have to thank the various Medical Officers of Health consulted for the assistance they gave me in the matter. From the reports received I gleaned one further fact: The notification of tuberculous disease is very imperfect, accordingly no inference as to morbidity of tuberculous disease can be drawn.

I cannot leave the subject of phthisis without entering a protest against physicians sending consumptive patients, and especially advanced cases, to the sea, without placing them under the care of a local medical man. I have many times been summoned for the first time to such cases when profuse hæmoptysis is taking place. On two occasions, at least, there has nearly been a fatality. The same protest applies to all cases of serious illness. In return I consider it the duty of all seaside practitioners, as well as those in other health resorts, to write to the ordinary attendant of a visitor and give him particulars of the nature of any illness of a serious character from which he has suffered whilst at the resort.

The seaside is considered, and rightly, to be beneficial to children suffering from pertussis; frequently they are there in large numbers. I do not think they often infect others in the open air. It is more than probable, however, that children, and adults sometimes, become infected by travelling with children suffering from whooping-cough, or in carriages in which they have travelled. In nearly a quarter of a century's practice at Bexhill I have only known of two families of children suffering from pertussis being brought down there by road, in one case in a private car, and in the other in an omnibus which was disinfected. If these children are brought down by rail it should be in a reserved compartment, which should be disinfected afterwards.

The Infectious Diseases Prevention Act might be made more effective in the prevention of the spread of infectious diseases if the schedule of diseases made notifiable under the Infectious Diseases Notification Act were enlarged to include pertussis, varicella, and measles and its congeners, and medical officers of health were required to prohibit the transport of sufferers or convalescents from these diseases without their sanction.

I have not been able to satisfy myself that the classes of cases popularly grouped together under the term "rheumatoid arthritis" are unsuitable for residence at the seaside, as is usually stated to be the case. Most, certainly not all, cases are made worse, and some improve and a few lose their symptoms if they can be persuaded to continue under treatment long enough. The osteo-arthritic type of case is the one least likely to improve. The small quantities of iodine—and iodides—in the atmosphere are probably beneficial.

On referring to Dr. Neville Wood's "Health Resorts of the British Isles," I note a striking fact: The reports from physicians resident in the South of England may be divided into two groups, South-Western and South-Eastern. Those from the South West of England state that rheumatoid arthritis and chronic rheumatism are made worse by residence at the seaside, whereas those

reports from physicians resident in the South-Eastern area either state that the condition of rheumatoid arthritis patients is not made worse or that this affection does not appear to originate in the respective seaside resorts reported on. I do not agree with the statement that rheumatoid arthritis never originates at the seaside. I think that the prevailing belief that cases of rheumatoid arthritis are made worse by residence at the sea can be explained by the fact that a large proportion of the residents there is composed of middle-aged and elderly people. It should be remembered, also, that arthritis tends to be a chronic disease, and at the best will take a chronic course, and requires prolonged treatment—so long and continuous that many patients desist from treatment when they have obtained relief from their more acute symptoms.

I have never met with cases of rheumatic fever originating in Bexhill. The few cases I have had to treat there have arrived in Bexhill with acute rheumatic symptoms, and have taken promptly to bed.

I have been greatly impressed by the fact that cases of acute bronchitis are very infrequent at the sea; mild cases occur in children when teething, and as a complication of measles and other exanthemata. I am inclined to attribute this immunity to the bacterial purity of the atmosphere; possibly its small iodine content may be a factor. The nature of the population at most seaside health resorts may also be a factor; at all, or most of such places, the well-to-do, well-clad and well-housed, preponderate over those less fortunate.

Sufferers from Graves' disease seem to me to congregate by the sea; at any rate, I have seen a large number there. I consider that they should not live too near the sea-front. They are more comfortable when living about half a mile inland on the higher ground away from the sea, and I always recommend that they spend the hotter months inland.

What classes of patients should be sent to the seaside to recuperate? No rules of general application can be given. The patient, his disease, age, occupation, and usual place of residence, &c., have to be borne in mind, in relation to the time of year; in fact, individual consideration of the patient's general condition is necessary rather than his disease, and especially whether he can bear, at times at any rate, exposure to strong or cold winds or excess of moisture. I have yet to learn of a seaside resort where strong winds never blow, even in summer time. Of course, some places are more sheltered than others, but, on the other hand, some patients require the bracing effect of air movement. Between Wick and the Scilly Islands or the South Coast there surely can be found some seaside health resort which will suit nearly every patient at any time of the year. The small residuum must be sent abroad in winter time.

There is perhaps one rule of general application. Residents at the seaside should be sent inland, and residents inland are likely to benefit by going to the sea. I will, however, mention a few classes of patients who in my experience especially benefit by a change to the sea: Convalescents from acute disease and operation (especially children); cases of neurasthenia; most cases of insomnia; hysteria; Graves' disease; the over-worked; cases of surgical tuberculous disease, of early phthisis, and of chronic bronchitis; cases of anæmia and chlorosis; patients with not too advanced cardiac disease; some cases of asthma; convalescents from tropical ailments, the South Coast being a favourite resort of Anglo-Indians and retired Colonial residents.

I would urge that this Section undertake a collective investigation of a number of specified diseases, to ascertain what diseases are specially benefited by residence in each of the various health resorts in the United Kingdom. The investigation would take some time, but by undertaking it the Section would, I feel confident, more than justify its existence.

Section of Balneology and Climatology.

President—Dr. A. HILL JOSEPH.

The Relation of Atmospheric Electrical Variations to the Incidence of Fits in Epileptics.

By G. MAHOMED, M.R.C.S., L.S.A. (Bournemouth).

FOR some years I have been recording observations on atmospheric electricity, and considering the possibility of its affecting health and disease. At the end of a paper read in 1917 to this Section, I stressed the following opinion: "I believe a high positive potential stimulates mentation and other psychic operations; and that a lower positive or possibly a negative condition stimulates skeletal and muscular growth." I adduced a few considerations—scarcely arguments—which appeared to favour these views. I have been thinking ever since how to get materials and observations to prove or disprove them. I came to the conclusion I could never make records sufficiently numerous and regular to be worth much for this purpose at the little hut where I make observations. I must use the records made at the two Government stations, Kew and Eskdalemuir.

It occurred to me that epilepsy offered a fruitful field. A fit is a recordable symptom. It is obvious. The sufferers would be in institutions. I therefore wrote to the Superintendent of the Epsom Epileptic Colony at Ewell and I was fortunate in obtaining from Lieutenant-Colonel Clarke, now Superintendent, the records for January to June, 1912, giving the daily number of inmates and the number having fits each day for that period. I then obtained the *Geo-Physical Journal* published by the Meteorological Office for that year, which gives the atmospheric electrical variations taken at six-hourly periods. It was necessary to average these for each day, to make a daily record, and I have plotted out the result on these charts (*see p. 10*). Each sheet gives two months' observations. I then plotted out the daily number of patients having fits. On comparing the two, there does not appear to be a very close correspondence, but considering that the fits only have a daily range of from thirty-six to fifty-eight, while the atmospheric potential ranges from below zero to 1,000 above it, it is not to be wondered at that they do not approximate very closely. I drew a line representing the six months' mean on each set of charts. The mean potential for six months is 242 volts, and the mean daily number of fits is forty-two. If now you count the number of days when the electric potential was above this average, with the days when the fits were above average you get the following results:—

KEW AND EPSOM, 1912.

			Potential			Fits		
January	...	...	26 days above	...	...	24 days above	...	...
			5 days below	...	...	7 days below	...	...
February	...	...	18 days above	...	...	19 days above	...	...
			10 days below	...	...	10 days below	...	...
			(1 day no observation)					
March	...	...	13 days above	...	...	18 days above	...	...
			18 days below	...	...	13 days below	...	...
April	...	...	17 days above	...	...	16 days above	...	...
			13 days below	...	...	14 days below	...	...
May	...	...	5 days above	...	...	9 days above	...	...
			26 days below	...	...	22 days below	...	...
June	...	...	8 days above	...	...	17 days above	...	...
			22 days below	...	...	13 days below	...	...

That is, two months are wrong—March and June—but the other four months show a very close agreement, the days of high potential being those of a high number of fits. This can scarcely be fortuitous.

There are, however, two points which need further consideration. One of these is the matter of negative readings. Some days a negative is recorded in one, or rarely in two, of the four-hourly observations. At first I subtracted these from the positive total and divided by four. But I have come to the conclusion this is not fair. We learn from these charts that apparently a high potential favours fits; and the tendency is to fewer fits as you get near zero, but when you go below zero and have a high negative it does not follow you are remote from fits. Quite the contrary; I expect it produces them. Everyone knows the irritated, unstable, psychic condition experienced by some before or during thunderstorms. At such times I have watched the potential change from 700 or 800 positive to 1,000 or more negative, and back again, within a few minutes. Again, if the four observations in a day were of 200 and 450 negative and of 300 and 350 positive, by subtracting you would arrive at the conclusion that it was a day of electric calm, the totals being in each case 650 and cancelling each other; whereas it was really one of considerable activity and a more just idea is gained by adding them and dividing by 4 = 325. I have therefore paid no attention to sign in drawing the later charts, and have made necessary alteration in the older ones. As a matter of fact the different methods made very little difference to the ratio; it only brought one day each in March and June above the line, and two in January, which made that reading less favourable to the rule.

It is probably the voltage that affects the nervous system, which is perhaps indifferent as to whether it is a positive or a negative condition. The voltage, as you know, is a measure of intensity. That is, as I think, a measure of the anxiety or eagerness of the prevailing electric atom to satiate itself by absorption in its opposite and the attainment of static calm. It has also been pointed out that electric energy is of the nature of a vibration, in the same way as sound and light waves are; and it seems reasonable to attribute physiological manifestations to a high intensity (or vibration) which may not be produced by a less intense one.

There is another consideration to be taken into account. In the records published by the Meteorological Office you will see the sign x placed instead of some of the four-hourly figures, and a note explains that on these occasions the trace ran off the tambour, and so no accurate observation could be made. This method of recording may be a safe and scientific procedure to adopt, but

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it is not a good one for our purpose. The trace reads up to 1,000 or 1,200 volts; in fact, at Eskdalemuir they registered 2,100, and if for a time the electrical potential was above the normal figures, it ought to receive some value in arriving at the mean potential for the day. I have therefore taken the figure of 1,200 volts as a fair reading on each occasion where x is recorded. They are not very numerous at Kew. This higher reading involves a change in the six months' average, and I have computed the average in the charts now shown as 299 volts instead of 242. This gives us:—

KEW AND EPSOM, 1912 (CORRECTED).

			Potential				Fits
January	...	...	22 days above average	...	23 days above		8 days below
			9 days below	...	8 days below		
February	...	...	14 + 1 days above	...	17 days above	3 on line *	
			14 days below	...	12 days below		= $\frac{2}{3}$
March	...	...	16 days above	...	17 days above		
			15 days below	...	14 days below		
April ...	...	...	12 days above	...	16 days above		
			18 days below	...	14 days below		
May ...	...	...	6 days above	...	8 days above		
			25 days below	...	23 days below		
June ...	...	...	7 days above	...	17 days above		
			23 days below	...	13 days below		

* February $\frac{14+1}{14}$.—There were twenty-nine days in February this year; fourteen days were above and fourteen below the six months' average. One day there was no observation because the water dropper froze. But frosts are always days of high potential; the succeeding days were of high potential and the unrecorded day ought to be reckoned as *above*.

Number having Fits in February.—I have recorded: "3 on line = $\frac{2}{3}$." By this I wish to express that on various occasions the number having fits happened to be the average number. In January there were two such cases. I reckoned one as *above* and one as *falling below*. In February there were three such. I counted two as being *above* and one *below*, giving myself the advantage of the doubt.

This corrected chart shows that April and June do not conform. In the original chart April did conform, but March did not. If you look at the chart for April you will see that on six days the potential falls between the former and the latter averages.

As I explained, on certain occasions the Meteorological Office places x and of course make their average from the other numerically recorded readings. I have taken an arbitrary figure and included that in the average estimation, and I have probably been a little too generous. This is the explanation of the transference of conformity from March to April. The higher readings caused March to conform and the higher average caused April to fail to do so in consequence of the generally lower average of potential in this month.

The meteorological report endeavours to give a value to the high fluctuations occurring in some months by attaching values 0, 1, and 2, representing the general electric condition of certain days. I give a table (extracted from *Geo-Physical Journal*) which shows that the largest number of days of such electric activity took place in March. This would seem to justify the correction I have made by neglecting the sign + or - instead of subtracting the latter from the ordinary positive readings.

It is interesting to note that in January both fits and potential are much above the average and that this gradually falls until in May there are more days below than above. The parallelism, however, remains.

ELECTRIC CHARACTER OF DAY.

0 = No negative reading.

1 = Negative for one hour.

2 = Negative for two hours.

January	...	...	...	...	Seven days were marked 2
February	...	...	...	...	Three days were marked 2
March	...	...	...	...	Twelve days were marked 2
April	...	...	...	...	One day was marked 2
May	...	...	...	...	Seven days were marked 2
June	...	...	...	...	Eight days were marked 2

The last series I have to bring before you is the number of fits that occurred daily at Caterham Mental Hospital during the first six months of 1919, compared with the electric potential at Kew for the same period. Dr. Leslie Gordon afforded me this opportunity. Caterham is a little farther from Kew than Ewell, but on the whole I think it is climatically allied to the Thames valley. The epileptic population varying from forty-nine to forty-one, and the number having fits from one to ten, I had to convert them into a percentage of epileptics resident. The potential for the period in 1919 was higher than that of 1912, being about 310, but allowing for the higher average it becomes 343. The correspondence seems to me fairly close, thus:—

KEW AND CATERHAM, 1919.

				Potential					Fits
January	...	...	...	23 days above 8 days below	...	...	...	...	17 days above 14 days below
February	...	...	...	20 days above 8 days below	...	...	...	...	19 days above 9 days below
March	...	...	...	16 days above 15 days below	...	...	...	...	18 days above } 3= 13 days below }
April	...	...	...	12 days above 18 days below	...	...	...	...	14 days above 16 days below
May	...	...	...	13 days above 18 days below	...	...	...	...	10 days above 21 days below
June	...	...	...	0 days above 30 days below	...	...	...	...	13 days above 17 days below

Here again the earlier months show a condition of atmospheric electricity above the six months' average, and the fits show the same. In March both are nearly equal; the three other months are below the average in both with fairly close resemblance, except June, in which every day was below the average. The fits in that month were nearly equally divided, but the incidence conformed to the rule; there was a majority below.

The other meteorological conditions in June, 1919, are such as would ordinarily suggest a normal, if not a high electrical condition. The barometrical mean was higher than the average of forty-five years, the temperature was slightly higher, the humidity less, and the rainfall less—30 mm. against 55 mm. But the fact remains that not one day in the month was up to the electrical average, while thirteen were up to the fit average. However, the non-conformity of June does not annul the conformity of the other months.

There is no electrical condition in the air inside a house. A house is,

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electrically considered, an elevation of the earth—it is negative—and the positive potential near a house is lower than in an open space. I have tried to get a reading close to an open window inside a house and failed. To some minds this will condemn the proposition which I have sought to establish in this paper. It will be said there is no electricity in houses; fits occur in houses, therefore there is no relation to electrical conditions. But this is not a true position. If you take the incidence of fits among a population which is partly confined to the house and partly allowed outside, a variation which agrees with an outside varying condition may be quite true. Moreover, in epileptic colonies they usually select patients who can be employed in outside work, such as gardening or agriculture, with a view to training them. In addition, other meteorological conditions affect sufferers, though they may not be directly exposed to them. A spell of cold winds and low temperature will affect respiratory diseases, though the sufferers may have been confined to the house. People who are affected by an east wind—asthmatics and sufferers from joint affections—can tell when the wind has shifted to that quarter before they have left their beds. I asked an asthmatic a short time ago if he were affected by east winds. He said, "I would not mind betting that I could tell nine times out of ten whether the wind had gone east before I put foot out of bed." I remember when I was post-mortem clerk coming down to Guy's Hospital one Monday morning to find fourteen bodies in the mortuary. We had had a London fog all Sunday, and many old heart cases had died in the wards.

It is admitted that other meteorological conditions influence patients who are supposed to be withdrawn from their influence while in bed, that is east wind and fog; so why should not the electrical? But there is another point. Professor Potter, at the Newcastle meeting of the British Medical Association, said that the breath of an insulated person affects an electroscope negatively; and that the air of a crowded lecture room gives a negative reading. I have not yet succeeded in confirming this; but it has occurred to me that a portion of atmosphere being connected with earth and surrounded by atmosphere of high positive potential ought to show a high induced negative. A certain number of fits occur at night and are not affected by atmospheric electricity, and a certain number by day and these are affected by the prevailing electric condition.

Much has been written on, and the most contradictory results have been obtained in, the examination of what has been called the psycho-galvanic reflex. Féré pointed out that "an emotional reaction was accompanied by electrical changes in the human body, demonstrable by galvanometric deflections when the resistance of the body to a weak electric current was being investigated." He noted that these changes were correlated with the alterations in volume of the limbs as shown by the plethysmograph, but were *insignificant in the normal person and were only established for hysterical persons*. This seems—working from the opposite view point—a rather striking confirmation of my position. Féré says an emotional reaction in an hysterical person will produce slight electrical changes; and I venture on the hypothesis that a slight electrical variation in the surrounding medium will produce a psychic reaction—a fit—in a person predisposed to them.

I cannot refrain from complimenting the Staffs at Kew and Eskdalemuir on the regularity of their observations. Except freezing of the water-dropper there seems to be no condition of weather that prevents their regular and exact observations. My own observations I find impossible to make in wet

weather, and even moist fog soon breaks down the insulation; and no observation of faint currents is then possible. It is a great relief to know that in these inquiries I am not responsible for the diagnosis of the epileptic phenomena, nor for the registration of the electric conditions. I am dealing with the published records of the Meteorological Office; and the fits are recorded by the officers of public institutions.

I am convinced that variations in atmospheric electricity are related not only to epilepsy, but probably to other diseases, such as asthma, and epidemics of diarrhoea, follicular tonsillitis, &c.; and that more or less constant local variations probably constitute one of the factors which contribute to those characteristics of health resorts, which lead to some being termed "bracing," others "relaxing," and so forth. The first requirement in further investigation of these points is an increase in the number of observing stations. Although Denmark, the Argentine, Batavia, and other Governments have maintained stations for these observations, it was not until the premiership of Mr. Balfour that a grant was made to Kew. The installation existed, but the money was obtained by charging manufacturers of instruments, such as thermometers, telescopes, &c., a fee for a certificate of accuracy. Atmospheric electricity has a diurnal variation. It is highest between 8 a.m. to 10 a.m., and 6 p.m. to 8 p.m., and lowest at 2 a.m. and p.m. It also has seasonal variation, being low at midsummer and midwinter, and higher at the intersolstices. But there are, no doubt, local variations due to influence of subsoil, configuration, forests, cascades, &c., but of such we have no information at all.

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The Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Section for the Study of Disease in Children.

President—Sir ROBERT JONES, K.B.E., C.B., F.R.C.S.Ed.

Splenomedullary Leukæmia.

By E. BELLINGHAM SMITH, M.D.

D. B., AGED 13 years, admitted to Queen's Hospital for Children, May 25, 1921. Mother stated that in October, 1920, the child had a severe hæmorrhage following extraction of teeth at Great Ormond Street. In December, 1920, had pain in left side, had become paler and thinner since that date.

On examination: Fairly well developed girl, with old hare-lip and partial cleft palate; no marked anæmia. The heart and lungs normal, but heart displaced upwards, the apex beat being outside the nipple in the fourth space. Several small shotty glands in neck, axillæ, and groins. Spleen enormous, occupying whole of left side of abdomen, and extending downwards almost to pubis. Below umbilicus it extended $1\frac{1}{2}$ in. to right of mid-line. Liver did not appear enlarged. Blood count showed: Red blood cells, 4,075,000; white blood cells, 652,000; hæmoglobin, 55 per cent. A differential count showed 88 per cent. myelocytes; polymorphs, 5 per cent.; lymphocytes, 5 per cent.; mast cells, 2 per cent.

On June 11, 1921, treatment commenced with collosol antimony, 1 dr. bis die by mouth in conjunction with X-ray applications to spleen and long bones once a week. On June 22, 1921, collosol antimony given intramuscularly, beginning with $\frac{1}{2}$ c.c. twice weekly, to be steadily increased.

On June 22, 1921, blood count showed: 4,750,000 red blood cells; 593,000 white blood cells; hæmoglobin, 60 per cent. Differential count: Polymorphs, 36 per cent.; myelocytes, 51 per cent.; lymphocytes, 4 per cent.; mast cells, 5 per cent.; hyaline cells, 4 per cent.; normoblasts, 1 per cent.; nucleated red 0.5 per cent.

On August 25, 1921, white blood cells had fallen to 170,000.

Collosol antimony continued up to 10 c.c. twice weekly until September 13, 1921. On September 21, 1921, sent away for three weeks' convalescence. Blood count on return (October 14, 1921): red blood cells, 5,000,000; hæmoglobin, 70 per cent.; white blood cells, 160,000. Differential count: Polymorphs, 70 per cent.; myelocytes, 8 per cent.; transitional, 6 per cent.; lymphocytes, 10 per cent.; mast cells, 4 per cent.; eosinophils, 2 per cent.

The spleen is smaller, and the child seems well except that she has lost weight recently.

Case of Œsophageal Stricture.

By E. BELLINGHAM SMITH, M.D.

J. H., BOY, aged 4 years 10 months. Admitted Queen's Hospital for Children, June, 1921, with history of persistent vomiting since 9 months of age. Patient was a full-time baby and weighed 9 lb. at birth. No previous

illnesses or history of swallowing corrosives. Child vomits all solid food immediately after administration, and frequently vomits liquids. Constipation severe.

On examination: Very wasted child, weight 15 lb. 9½ oz., height 33 in. There are no abnormal physical signs in lungs, chest or abdomen. For some days after admission vomited all solids and semi-solids, which were returned unaltered almost immediately after ingestion.

X-ray photograph with barium showed obstruction to passage of meal about level of seventh dorsal vertebra, no œsophageal pouch, but an obstruction, apparently a stricture, about an inch in length, just above cardiac orifice of stomach.

My surgical colleague, Mr. Lake, passed an œsophagoscope and reported that there was definite resistance to the passage of the œsophagoscope about 2 in. above the cardiac orifice and just above the stricture a small shallow ulcer. Bougies 1 to 5 were passed, but a No. 6 could not be introduced.

After dilatation there was distinct improvement, and a fortnight later Mr. Lake succeeded in further dilating to No. 8. Since then progress has been uneventful, and the weight is now 18 lb. 14 oz.

The Wassermann reaction is negative.

Case for Diagnosis.

By J. PORTER PARKINSON, M.D.

PATIENT, a girl, aged 13 years, admitted into hospital with history that cheeks had been swollen for ten weeks; left side began first with discharge from the left ear, then right side began to swell, and finally parts beneath chin. She had headaches and hot sweats.

On admission there was considerable swelling of soft tissues of cheeks and below chin. Swellings hard and hot to touch. There were also similar swellings on backs of both arms. Enlarged glands could be felt in both axillæ and in supraclavicular regions. Slight discharge from left ear. Slight fever on admission, which abated in a few days. Heart, lungs, and abdominal organs were healthy. There was very marked erythema nodosum on both legs. Hypodermic needle introduced into swelling grew on culture Gram-negative bacillus resembling Vincent's fusiform bacillus.

Swellings have become considerably reduced during past fortnight.

Dr. F. PARKES WEBER thought this was a case of multiple subacute inflammatory foci in the subcutaneous tissue and muscle, due to a micro-organismal infection, the pathogenic micro-organisms being of insufficient virulence to cause actual local suppuration. Similar cases had been described as subacute dermato-myositis. He did not think the muscles in this particular case, however, were very much involved. Very few cases had been recorded in England. Erythema nodosum was occasionally associated with various microbic infections.

Specimen of Congenital Malformation of Œsophagus.

By C. E. SHATTOCK, M.S., F.R.C.S.

THE child was aged 10 days, had lost 2 lb. in weight since birth, and regurgitated all food immediately after swallowing. The stomach and intestines were much distended with air.

Post-mortem.—The patent lower portion of the œsophagus extended upwards from the cardiac orifice to open into the trachea about its bifurcation. The upper portion of the œsophagus ended blindly about this level.

Syphilitic Infantilism with Splenomegaly.

By E. BELLINGHAM SMITH, M.D.

E. M., GIRL, aged 17 years, came to St. George's Hospital on September 30, complaining of pain in left leg, of one month's duration.

On examination: Patient appeared to resemble child of 11 or 12 years. No development of breasts, axillary or pubic hair, and menses had never appeared. Head bossy, and upper incisors notched and peg-shaped. Palpation of abdomen revealed enormous spleen, occupying whole of left side of abdomen and extending downwards and forwards below umbilicus to right of the mid-line. Liver readily palpable two finger-breadths below the costal margin. At lower end of left femur is a large swelling, somewhat tender to touch and suggesting a syphilitic periostitis.

The family history shows that the mother had nine pregnancies, of which six children are alive; one was a stillbirth and two were miscarriages.

The Wassermann reaction in patient is positive.

The blood count shows 4,880,000 red cells, some poikilocytosis and vacuolation. White cells, 3,940; polymorphs, 72 per cent.; lymphocytes, 18 per cent.; mononuclears, 8 per cent.; hæmoglobin, 55 per cent.

X-ray photographs of left femur show a well marked periostitis.

Case of Recurrent Purpura with Joint Lesions and Fractures.

By ERIC PRITCHARD, M.D., and B. WHITCHURCH HOWELL, F.R.C.S.

PATIENT, a boy, aged 9 years.

History: Aged 2 years, swelling of hands and elbows; treated as rheumatism in London Hospital; legs affected later. Aged 6 years, had mouth-bleeding. Family history negative. 1919: Treated as for tubercle of right knee and left ankle, as out-patient at Queen's Hospital for Children. June, 1920: First seen by me (B.W.H.) after patient had returned from fever hospital after scarlet fever. Right knee: Slight limitation of movement, especially full extension, with thickened synovial membrane. Left foot: In position of talipes equino-varus, with periarticular thickening. Definite bruising of right leg, with petechiæ on abdominal wall, with history of recent hæmoptysis. Admitted to medical ward. Diagnosis: Hæmophilia; treated with hæmostatic serum, horse serum, with very marked local reactions; coagulation time, 3 minutes 5 seconds. December 17: Much hæmorrhage in buttock, following injection of 25 c.c. horse serum. December 30: Fell off chair and broke right femur and tibia. X-ray: Subperiosteal fracture at lower third of femur; of tibia at upper third. Treated by extension on Thomas's splint. June 23, 1921: Hæmorrhage into right elbow-joint. October 6: Right lower limb 1 in. longer than left; treated by $\frac{1}{2}$ in. thickening on left sole and heel. October 22: Readmitted to medical ward under Dr. Pritchard, with relapse in left ankle.

Points raised: (1) Exact diagnosis; (2) treatment of joint conditions; (3) lengthening of fractured limb.

DISCUSSION.

Dr. ERIC PRITCHARD said this had been a very tiresome, chronic condition, which had not responded to any medical treatment. He regarded it as a case of ordinary purpura. The patient was originally admitted as a hæmophilic, but the coagulability of the blood did not seem to be very abnormal. Was there any association between purpuric conditions and fragility of bones? He had had another case of purpura in which there were multiple fractures. The purpuric symptoms arose when the boy was 2 years old, and had continued since, with more or less long intervals in between. The child knew quite well when an attack was coming on; he was then a good deal depressed. He knew equally when the attack was about to subside, for then his spirits rose.

Dr. F. PARKES WEBER remarked that some conditions of recurrent purpura in children had been described as "pseudo-hæmophilia"—"essential thrombopenia"—the blood-clot being deficient, though commencing to form within normal time.

Duodenal Ulcer in Infancy.

By DONALD PATERSON, M.B.

[This Paper has been published in full in the *Lancet*, January 14, 1922, p. 63.]

(SUMMARY.)

(1) DUODENAL ulcer is a rare condition in infants, but more careful examination of the duodenum in marasmic infants may show it to be commoner than is at present admitted.

(2) Ulcers may be present in *melæna neonatorum*. In older infants they may follow on any gastro-intestinal upset.

(3) They may certainly complicate extensive septic burns or septicæmia. Tuberculosis is the common cause of duodenal ulcers in older children.

(4) The diagnosis of duodenal ulcer is difficult and usually not made.

(5) Duodenal ulcer may be successfully treated by operation.

"Case of Renal Dwarfism," by DONALD PATERSON, M.B., shown at the October meeting, is published in full in the *British Journal of Children's Diseases*, October to December, 1921, xviii, pp. 186-188.

Section for the Study of Disease in Children.

President—Sir ROBERT JONES, K.B.E., C.B., F.R.C.S.Ed.

Fatal Case of Bullous Eruption.

By EVA MORTON, M.R.C.S., L.R.C.P.

[The case is published in full in the *British Journal of Children's Diseases*, October-December, 1921, xviii, pp. 188-192.

THE patient was a girl, aged $7\frac{1}{2}$ years, with a history of measles two years ago, and of varicella last June.

She was taken ill on September 25, the symptoms being headache and discharge from the eyes, but she went to school on the 26th. On the 28th a rash, described by the parents as "red pimples," developed over the trunk and limbs, which by the next day resembled that of measles, but with the lesions more raised and prominent than is usual in measles. There was a considerable semi-purulent discharge from the eyes. On the evening of the 29th, twenty-four hours after the first appearance of the rash, a bullous eruption developed, beginning on the chest but rapidly spreading in fresh crops to other parts of the body. On the 30th the patient was admitted to the Grove Hospital with a diagnosis of measles.

On admission there was a morbilliform rash over the whole of the body with the exception of the scalp and gluteal region. There were bullæ over the face, trunk and limbs, of all sizes up to an inch or more in diameter, many of which had ruptured, leaving the epidermis wrinkled and hanging in shreds, exposing deep red patches of true skin. The eyes were swollen, and the eyelids, completely denuded of skin, were stuck together. The lips were swollen, cracked and dry. The temperature on admission was 101° F., and the pulse 140. Rhonchi were heard over both lungs, and there was dullness at the right base, but the respiratory symptoms were slight. The heart sounds were normal.

Next day, October 1, the bullous condition had extended on to the scalp and gluteal region, and the whole of the epidermis appeared to be loosened, peeling off very easily. Attempts were made to obtain blood for examination, but serum alone was exuded at each puncture, and the attempt was given up, the child being practically moribund. The urine contained albumin but was otherwise normal, the diazo reaction also being negative. The patient was semi-conscious and became very restless during the day, the pulse rising to 240, and thirty hours after admission she died.

A post-mortem examination was made, but apart from a broncho-pneumonic condition of the right lung the viscera were healthy.

The photographs shown were kindly taken by Dr. Thomas Brushfield.

The diagnosis appears to lie between acute pemphigus and measles complicated by a bullous or pemphigoid eruption. Dr. J. D. Rolleston referred me to a case which was published in the *American Journal of Diseases of Children* last year, by Neff, who gave a reference to a case of Henoch's about thirty years ago; both these cases very closely resembled this of mine. Henoch's case was diagnosed as acute measles with pemphigus.

[November 25, 1921.]

Cockayne: Case of Dwarfism

Dr. J. D. ROLLESTON said that when he saw this case he thought the condition was pemphigus, but remembering reading Neff's case in the *American Journal of Diseases of Children*, and seeing the case reported by Henoch, he came to the conclusion that it was morbilli bullosi. It was an extremely rare condition, in fact no cases had been described in English literature before, and apparently none had been recorded in France, though a few cases had been reported as having occurred in Germany.

Case of Dwarfism.

By E. A. COCKAYNE, M.D.

D. S., AGED 7 years 8 months. Parents healthy and of average stature. The girl was not small at birth and progress was normal until 3 years of age, when growth ceased suddenly. No growth took place for the next three years, although she was given thyroid extract $\frac{1}{2}$ gr. twice a day for the last three months of that period. At 6 years of age she was exactly the same height as her younger sister, aged 3 years. One tablet of triglandin was then given three times a day and she grew $\frac{1}{2}$ in. in the first two months and a further $\frac{3}{4}$ in. in the next two months. Growth entirely stopped for the next four months, but during the next month she grew another $\frac{1}{2}$ in., although she had had no drug treatment for nine weeks. She was stationary again for six months, then grew $\frac{1}{4}$ in., and has been stationary again for the last five months. For the last seven months she has had triglandin again. She is short and broad with rather a broad flat face, and has a deep voice. There is no mental defect. No evidence of myxedema or achondroplasia. Sella turcica normal. Blood-pressure 70 systolic. No albuminuria. Wassermann negative in mother and child.

Case of Cardiospasm.

By E. BELLINGHAM SMITH, M.D.

W.B., A MALE, aged 1 year 10 months. Full time infant, breast fed for two months, then fed on cow's milk and Nestlé's. At 5 months of age began to vomit. Has vomited brown fluid like chocolate. Can keep down fluids, but vomits all solid food. Family history: Two other children alive, aged $8\frac{1}{2}$ and 10 years. Four miscarriages. Wassermann reaction in child negative. On examination: Fairly well developed child, but pallid with poor nutrition. Heart, lungs and abdomen, reveal nothing abnormal. Since admission to hospital has vomited all solid food but will retain liquids and thickened feeds. His weight to-day, November 25, is 2 lb. less than on admission on August 13, 1921. Child seems hungry and seizes ravenously any bread and butter, but after two or three mouthfuls the bread and butter is returned unchanged.

The passage of soft oesophageal tubes has not revealed any obstruction and a barium meal on two occasions has appeared to flow readily into stomach.

I brought the child up hoping to get assistance as to how I am to treat him. We have given bromides and belladonna, but nothing seems to have any effect on this condition. The child is steadily losing weight; if the loss proceeds at this rate he must eventually die.

Postscript.—The child subsequently contracted nasal diphtheria, and died in a fever hospital. Death, however, was not due to diphtheria, but to inanition caused by the original condition.

Case of Gumma of the Liver and Sclerodermia of Face.

By E. BELLINGHAM SMITH, M.D.

B. M., A GIRL, aged 12 years. Admitted to hospital for pain in the abdomen of one year's duration. On admission: A very undersized child, 3 ft. 9 in. high, and weight 3 st. 4 lb. Complexion sallow, frontal bones bossed, facies expressionless; skin of forehead, nose and cheeks, glistening and inelastic; no wrinkling takes place on smiling or frowning. Nose is flattened and there is a bilateral discharge from the nostrils. On examination of the abdomen a large mass about the size of an orange presented itself in the epigastrium, and rather to the right of the mid-line. This tumour was situated in an enlarged liver, which reached almost to the umbilicus. The tumour was tense and elastic; between it and the right costal margin could be felt a smaller and harder mass in the liver substance. The blood count shows no abnormal changes. The Wassermann reaction is positive. Three weeks' treatment with mercury and iodide have caused the large tumour almost to disappear, but the liver is still greatly enlarged and small masses can be felt. The sclerodermatous condition of the face is unaltered.

Case of Fracture at the Elbow-joint.

By B. WHITCHURCH HOWELL, F.R.C.S.

A. B., AGED 9 years, fell on his left hand on August 4, 1921, and sustained a fracture of the elbow-joint, with a dislocation of the head of the radius.

Points brought out by the X-ray plates: (1) Separated epiphysis of the lower end of the humerus, (2) fractured olecranon process, (3) fracture of coronoid process.

Treatment: Acute flexion by the "collar and cuff" method of Sir Robert Jones—in spite of the fracture of the olecranon process.

Present condition, November 11, 1921: Full and painless flexion and supination. Extension incomplete by 30° (extension should be complete by January or February, 1922). Union of the olecranon.

The PRESIDENT said Mr. Howell's case was a very interesting one, and the result was very good; he was quite in accord with the treatment which was adopted. He believed that in this case any attempt at early movement would be a danger; it was better to keep the arm in a position of acute flexion and gradually lessen the flexion. In uncomplicated fracture of the olecranon it was advisable to keep the arm fully extended for ten days, but in supra-condylar fracture, and, indeed, in nearly all other fractures of the elbow, the arm should be supinated and the thumb placed in the bend of the elbow while it was fully flexed. The shadow seen in the skiagram suggested a commencing myositis ossificans. This was an indication against early passive movement, as it would cause a further outgrowth of bone; rest favoured absorption; masses of adventitious bone diminished under complete rest.

Juvenile General Paralysis.

By BERNARD MYERS, C.M.G., M.D.

THE patient, J. F., girl, aged 11 years, came to the Royal Waterloo Hospital as an out-patient on February 11, 1921. She complained of inability to walk properly for the last few months, and the mother gave the following history:

She first walked when 4 years of age. At 3 months old she is stated to have had "consumption of the bowels." No history of convulsions. She has fainted at school (? petit mal). The mother stated that the child always had distinct difficulty in learning.

She sleeps fairly well, and has control over bowels and bladder. The legs and arms are stiff, especially the left arm and leg; the knee-jerks are distinctly increased, especially the left. There is a right big toe extensor response, and the supinator and triceps jerks are increased on both sides. The walk is spastic.

There is one other child, a girl, a year younger, who is quite well and without sign of syphilis. Her mother is in good health, and states that she has not had any miscarriages. The father has since informed me that he had lately been to St. George's Hospital, where his Wassermann reaction was found negative.

A provisional diagnosis of cerebral diplegia was made. As the upper incisors were noticed to be notched and the frontal eminences well marked, the Wassermann reaction was carried out and found to be distinctly positive. She was then admitted to the ward and given intragluteal injections of glucose galyol, commencing with 0.02 gm. and $\frac{1}{2}$ gr. of mercury in the form of mercurial oil. She also took grey powders, 1 gr., thrice daily after food. The glucose galyol was continued weekly, and increased to 0.05 gm. She was also given a mixture of potassium iodide thrice daily. The anti-syphilitic treatment was apparently not successful, in fact she seems to have become steadily worse. Her memory was fairly good when first seen, but is now certainly very deficient.

Condition on September 2: She attended hospital as an out-patient again chiefly for herpes zoster of the right lumbar region, and while a photograph was being taken she had an attack of petit mal. On October 22 she was readmitted to hospital, as her mental condition had become much worse. She was unable to express herself freely, and had a difficulty in pronouncing some words, a thickness and slurring of speech being apparent. Some fine tremors of the tongue were noted, and, on one or two occasions since, tremors of the lips.

Present condition: The power of concentration is much decreased, and her general mental condition is now like that of a child of 3 to 4 years of age. Before going to sleep at night, the sister of the ward states, she frequently claps her hands together as if she were in a state of great joy, and apparently very pleased with some passing thoughts. Her general attitude is that of listlessness, disinterestedness in her surroundings, and loss of self-control. She has lately lost control of the bladder and bowel, and is stated to have become dirty in her habits. The pupils are moderately dilated and apparently fixed, practically no reaction to accommodation or light being obtained, although there was definite reaction to accommodation until recently. For a few weeks she has been unable to walk, and is now confined to bed.

A second Wassermann reaction was carried out again at the end of June and found to be positive. The cerebro-spinal fluid was also positive on November 4, and Dr. Leatham stated that the fluid contained twenty lymphocytes to each cubic millimetre, and that Noguchi's reaction was positive. Since then Dr. Joekes has performed Lange's colloidal gold reaction, and found it to be in favour of general paralysis.

Examined a few days ago, the patient, although able to touch her nose with her eyes open, was unable to do so when they were closed. The right

big toe no longer gave an extensor response. The knee-jerks were distinctly plus, especially the left, and ankle clonus was marked on each side; in fact when the heels are raised from the ground and the knees separated, the feet are in a state of clonus. The soles of the feet are very sensitive, but there seems to be an anaesthesia or certainly diminished sensation around the ankles. There are days when she is apparently worse than others, her speech then becoming more difficult and her mind more confused.

Dr. Bickerton kindly examined her eyes about six weeks ago and found no abnormality. When he again examined her two days ago his report states: "Both discs show clearly defined margins, but one rather paler than normal. Vessels normal, no other changes in fundus. Pupils semi-dilated and do not react to light, but appear to react slightly on accommodation. No nystagmus, no paralysis of extra-ocular muscles. It is difficult to test, but I do not think the vision is really normal."

This case is therefore brought before the members of the Section with a suggestion that the patient suffered originally from secondary amentia (syphilitic), and that now she is in a state of juvenile general paralysis; and also to ask if they can suggest any further treatment.

Case of Persistent Jaundice.

By G. A. LEVISEUR, M.R.C.S., L.R.C.P.

PATIENT, a girl aged 5 years 7 months, was brought to the Children's Hospital, Great Ormond Street, and was admitted under Dr. Thursfield. There was a history of jaundice of four weeks' duration. The child was first noticed to be ill on September 12, ten weeks ago, with feverishness and epigastric pain and vomiting. A week later she became jaundiced, her urine was noticed to be brown and stools pale, but she complained of no discomfort. After three weeks the jaundice was almost gone, but on October 10, four weeks after onset, it deepened, and on October 17, five weeks after onset, she was admitted to the Children's Hospital. There is a previous history of measles and chicken-pox. Three years ago she suffered from what the mother described as "swelling of the joints." There is nothing of importance in the family history. On admission the child was thin, but well-developed. The skin and mucous membranes were distinctly jaundiced. The tongue was clean, and the throat not inflamed. The respiratory and cardio-vascular systems showed no abnormality.

On examination of the abdomen, the liver was found enlarged and firm. It could be felt 3 in. below the costal margin in the right mid-clavicular line. The spleen was easily palpable. The urine showed bile present in fair amount, while the stools were pale. During the patient's stay in hospital the liver has become smaller and the spleen less easily palpable, while the jaundice has fluctuated in intensity. Since October 29 the jaundice has diminished, the bile in the urine has become less, and the stools have become more coloured.

The blood showed a white cell count of 20,000, but otherwise appeared normal. No abnormal constituents were found in the urine except bile. The Wassermann reaction is negative. During the last week the jaundice has rapidly decreased. The spleen is no longer palpable, while the lower border of the liver is now $1\frac{1}{2}$ in. below the costal margin.

The case is of interest on account of the long continued jaundice (for nine

weeks), the fluctuation of its intensity, and the splenic enlargement. Lastly, it is interesting to speculate whether the injury to the liver is likely to lead to a cirrhotic condition in later life.

I have to thank Dr. Thursfield for permission to show this case.

DISCUSSION.

Dr. COCKAYNE said he saw no reason for doubting the diagnosis, as cases did occur in which the degree of jaundice fluctuated; and enlargement of the spleen was quite common in severe cases of catarrhal jaundice. He was sure cirrhosis of liver might follow catarrhal jaundice. One child contracted the disease during an epidemic in a school in London, remained ill a long time, and after several months developed ascites. The liver could be felt to be hard. He did not doubt it was an example of cirrhosis of the liver following catarrhal jaundice.

Dr. H. THURSFIELD asked what was catarrhal jaundice? In his experience, the majority of cases of catarrhal jaundice in children were confined to a particular season of the year; it was seldom seen before October or after March. If seen early enough, the cases were always febrile, and the spleen was considerably enlarged. Most would agree that catarrhal jaundice, as seen in children, was a seasonal specific infective disease. As to its pathology, he thought that while the majority of cases of catarrhal jaundice in children were slight infections, every grade occurred, extending even to the severe icterus gravis. At post-mortem examinations on subjects of icterus gravis there was found a most acute hepatitis—he had seen a case of destruction of every bit of liver tissue, and nothing left but the portal canals and a few liver cells. His own view was that catarrhal jaundice and icterus gravis were the same, but varied in the severity of the infection. Therefore when confronted with a case of catarrhal jaundice in childhood one should be particularly cautious as to prognosis.

Section for the Study of Disease in Children.

President—SIR ROBERT JONES, K.B.E., C.B., F.R.C.S.Ed.

Case of Abnormal Adiposity following Meningitis.

By A. LEVISEUR, M.R.C.S., L.R.C.P.

THE patient, a girl, now aged $2\frac{1}{2}$ years, was admitted to the Children's Hospital, Great Ormond Street, under Dr. Thursfield, in January, 1920, aged 5 months, suffering clinically from meningococcal meningitis, which had commenced ten weeks previously. No meningococci were demonstrated in the cerebro-spinal fluid. Blind on admission. Energetic treatment by injections of anti-meningococcal serum, both by intrathecal and intravenous routes commenced.

Discharged one month later, but sight did not return till about six weeks afterwards.

To-day, two years after onset, her contours have the appearance of those of a matron aged 40, rather than those of a child of tender years. There is an abnormal deposit of subcutaneous fat all over the body, most marked in the region of the breast and thighs. She has never learnt to walk properly, owing to defective co-ordination. Though her head is 2 in. larger than is usual in a child of her age she appears intelligent and bright. She now sees well, and her discs appear normal. The X-ray of the skull shows no bony abnormality in the region of the pituitary gland. After administration of 50 gm. of glucose no sugar is apparent in the urine.

The points of interest are the extraordinary fatness of the child, and the fact that she has made such a good recovery after meningococcal meningitis.

DISCUSSION.

Dr. HUGH THURSFIELD said that when the deposit of fat was first noticed it was even more marked than now; since then he thought the child had become less fat and more muscular; it was the excessive deposit of fat—it hung in rolls—in the earlier period which reminded him of Fröhlich's syndrome. Another feature was, that at the time she was in hospital she had frequency of micturition, and the quantity passed was abnormally large; in fact it was almost impossible to keep her dry: probably she had some polyuria and polydipsia. An excessive deposition of fat following meningitis which was presumably meningococcal was very rare in his experience; it was far more usual for children recovering from meningococcal meningitis to remain thin, though quite healthy.

Dr. E. CAUTLEY (Chairman) asked what the diet of the child had been. The case suggested over-feeding. Dr. Thursfield's remark as to the polyuria suggested the possibility that the child might have been eating an undue quantity of sugar, with the obesity as a consequence. He (Dr. Cautley) did not think there was enough to warrant the diagnosis of Fröhlich's syndrome. In the few cases of Fröhlich's syndrome which he had seen there was mental dullness, in contrast to the mental alertness of this patient. There should be a further report on the patient, in six or twelve months' time, after she had been running about. Possibly after exercise for a month or two the obesity would disappear. If so, that would show that her present condition was dependent on the conditions under which she had been living, rather than on any endocrine defect.

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Dr. LEVISEUR (in reply) said the child's mother stated the patient did not take her food well, nor in any extra amount. The Wassermann test of the cerebro-spinal fluid was negative, therefore it was probably not a syphilitic case. It might be an example of dyspituitarism, but not necessarily so.

Case of Defective Ossification of Skull.

By E. A. COCKAYNE, M.D.

R. E., AGED 5 years 8 months. There is a considerable interval between the two halves of the frontal bone, between the frontal and parietal bones, and between the two parietal bones. The edges of the bones are slightly raised. The anterior, posterior and lateral fontanelles are all open. The X-ray shows bones of uniform and normal thickness. The head is well shaped and of average size (20 in.). The clavicles are normal. There is no history of fracture, and the long bones are not deformed. A large vein runs from the base of the nose upwards along the course of the frontal suture. On coughing the apex of the right lung bulges above the clavicle. The condition may be an incomplete form of cleido-cranial dysostosis. The clavicular defect in this disease is very variable and sometimes only unilateral.

Case for Diagnosis.

By E. BELLINGHAM SMITH, M.D.

J. C., AGED 4½ years. Admitted to hospital on July 7, 1921. Full time baby, 10 lb. at birth: no previous illness of interest. Family history, good. In January, 1921, began to have a cough. In April had diarrhoea; since then has had alternate diarrhoea and constipation. In May the abdomen was noticed to be enlarged.

On admission: Fat, well nourished boy. Some dyspnoea, face highly coloured, no cyanosis; temperature, 103° F.; respirations, 86; pulse, 124; bowels not opened, two days. An examination of the chest showed some impairment of note at the base of the right lung, with crackling râles in both lungs. The abdomen was distended but the spleen and liver were not enlarged; no free fluid was detected. The diagnosis made was one of unresolved pneumonia.

Between July 7 and 12 he had two attacks of hæmoptysis, coughing up about 2 oz. of blood on each occasion.

He remained in hospital until August 1, 1921, with slight irregular evening temperature, and was then sent to a convalescent home. The signs in the chest were unaltered and still suggested a condition of incompletely resolved pneumonia.

Patient was readmitted in October, 1921. The signs in the chest were as before and he was having frequent attacks of dyspnoea of asthmatic type. Since October he has had periods of diarrhoea with high temperature alternating with constipation or normal stools. The abdomen has never varied in size and the colon now appears to be definitely thickened and enlarged. The chest is barrel-shaped: there is dyspnoea on exertion and the signs are those of chronic bronchitis and emphysema.

Bismuth X-ray plates seem to show a definite dilatation of the splenic flexure and first part of the descending colon.

The case is shown with a view to eliciting the opinions of members of the Section as to whether this is a case of Hirschsprung's disease, associated with chronic bronchitis and emphysema, or as to whether it is some form of chronic tuberculous infection.

DISCUSSION.

Dr. E. CAUTLEY (Chairman) agreed with the exhibitor's view about this child's chest, that there was chronic bronchitis and emphysema, and some consequent asthma. The abdominal condition was like that sometimes spoken of as "potato-belly" in children, known to follow the eating of huge quantities of potatoes, and fairly frequent in Ireland. He thought he could feel the descending colon in this child, also a part of the transverse and part of the ascending colon, giving the impression that it was megacolon. But he did not know whether there was present more than colon enlargement due to constipation; he was not clear as to the possibility of its being Hirschsprung's disease. The attacks of fever were associated with diarrhoea, but the diarrhoea was a short attack during one long period of fever. There might be some condition in the chest which caused the fever, and had possibly set up the diarrhoea. The child should be given an opaque meal, and good skiagrams should be taken, the colon being examined after a bismuth enema. Dr. Bellingham Smith told him that the skiagram showed a mass in the descending colon only nine and half hours after the meal. That did not suggest any defect in the musculature above that point. Therefore it was more probably an enlargement of colon due to constipation.

Dr. THURSFIELD offered diverticulitis as a possible explanation to be considered. It was not a diagnosis, but a suggestion made on the spur of the moment.

Specimen of Teratoma from an Infant.

By E. BELLINGHAM SMITH, M.D., and E. A. SHAW.

THE specimen shown is from an infant, aged 3½ months, who was admitted to hospital for progressive enlargement of the abdomen. An examination of the abdomen showed a large tumour filling the whole of the left loin and projecting forward and inwardly so as almost completely to occupy the whole of the left side of the abdominal cavity. The child was breast fed and there were no symptoms beyond those mentioned, namely, enlargement of the abdomen. Four days after admission the temperature rose suddenly to 104° F. and the child became seriously ill with vomiting and green stools. Drowsiness and coma supervened and the child died in three days.

Post mortem the teratoma exhibited was found occupying the upper half of the left side of the abdominal cavity, and intimately adherent to the stomach, spleen and left lobe of liver. The specimen shows solid and necrotic areas, and at the upper side on its anterior aspect it communicates directly with what appears to be a large 1 by 1 in. ulcer in the stomach. The edges of the ulcer are healed and smooth. Sections from this tumour show skin, hair follicles, connective tissue, muscle, cartilage, lymphoid tissues, &c.

Dr. E. CAUTLEY (Chairman) said the lesion in the stomach had remarkably smooth walls, and if it was an ulcer it must have existed a considerable time; and there was no history of hematemesis, or of anything pointing to gastric ulcer. Possibly it might be the connecting link between the secondary fetus and the primary one, which embraced it. He had not seen a specimen like it, and gastric ulcer at this age was exceedingly rare.

Section for the Study of Disease in Children.

President—Sir ROBERT JONES, K.B.E., C.B., F.R.C.S.Ed.

(?) Congenital Mitral Stenosis.

By B. T. PARSONS-SMITH, M.D.

E. S., AGED 15 years. An undersized, delicate looking boy, poor in physique and general development; weight, 5 st. Mentality about the average. Past history: No evidence of illness.

Present condition: Subjective symptoms—breathlessness when going upstairs, and cough on exertion or hurrying. Objective symptoms—throat healthy; heart enlarged; præcordium prominent (apex beat, fifth space, $4\frac{1}{2}$ in. from mid-sternal line); engorgement of superficial veins of upper thorax; heart rhythm regular, but fast; presystolic thrill at apex, loud first sound and systolic shock; pulmonary second sound accentuated; vessels normal; blood-pressure: 130 mm. systolic, 85 mm. diastolic; no jugular or visceral stasis.

The electro-cardiogram shows a regular heart beat at 120; the individual complexes are composed of the normal series of waves in normal sequence; the auricular wave is unduly prominent and at times bifid: the P.R. interval varies from 0'18 to 0'20 seconds; right ventricular preponderance is well displayed.

The point of the case is to decide whether the patient has a true congenital lesion, or whether there is deformity of valve associated with interference such as is produced by infection since birth. I think his lesion must have been present five or six years.

DISCUSSION.

Dr. F. PARKES WEBER said the condition was certainly mitral stenosis and therefore probably it was of post-natal origin. In many cases mitral stenosis appeared after but slight rheumatic fever; and the congenital occurrence of mitral stenosis had been proved in only very few cases. He thought this was a case which had followed unrecognized rheumatic fever. The present case was associated with a certain degree of infantilism or dwarfism, and many cases of the kind had been described, especially in France, under the heading "mitral dwarfism" or "nanisme mitral"; but mitral dwarfism was only one form of "cardiac dwarfism."

Dr. G. A. SUTHERLAND thought the ordinary examiner would say this case fulfilled all the requisites of an acquired mitral stenosis. Against Dr. Parsons-Smith's view was the fact that the discovery was first made in the boy at his fifteenth year. No one could disprove the suggestion that it might be congenital, but the onus was on the exhibitor to prove that it was. He remembered one case which he thought was congenital: the child was $2\frac{1}{2}$ years of age—i.e., before the period at which one expected to find a rheumatic infection. The fact that in this case there was no history of rheumatism counted for nothing; some of the worst cases of heart disease he had seen had been in children who came with very advanced heart disease at their first visit and had never been known to suffer from any form of rheumatic infection.

Dr. BELLINGHAM SMITH agreed with Dr. Sutherland's view. Cases of rheumatic heart disease occurred without rheumatic symptoms occurring elsewhere. In recently looking through records of post-mortem examinations on cases of congenital heart

¹ Cf. F. Parkes Weber, "Mitral Dwarfism," *Brit. Journ. Child. Dis.*, 1913, x, pp. 203-205.

disease he found that in forty-eight cases there was one, in a child aged 18 months, in which there was distinct mitral endocarditis with deformity and constriction of the mitral valve; therefore there was something to be said as to the possibility of mitral stenosis being congenital. There was also the question of malformation. In another of the forty-eight cases there was almost complete stenosis in an infant aged 3 months, a purely developmental defect. But he did not regard the present case as congenital.

Dr. PARSONS-SMITH (in reply) expressed his agreement with those who did not regard the lesion as congenital and withdrew that adjective. When he first saw the boy he regarded that diagnosis as somewhat doubtful, and he had not been able to adduce satisfactory proof of the congenital nature of the condition. He fully agreed with Dr. Parkes Weber that the case should be classified "mitral dwarfism."

Case for Diagnosis.

By B. T. PARSONS-SMITH, M.D. (for J. STRICKLAND GOODALL, M.B.).

E. M., MALE, aged 11 years. Complaint: Palpitation as long as he can remember, and shortness of breath with exertion.

Past history: Measles slight, aged 3 years; examined by school doctor, aged $4\frac{1}{2}$ years, and certified to be suffering from heart disease. Attends special school.

Present condition: General development poor. Slightly prominent præcordium. Heart enlarged: apex beat, fifth space, $3\frac{3}{4}$ in. from mid-sternal line: rhythm regular; systolic and harsh diastolic murmurs at aortic base; latter, maximum at third left space (and coarse diastolic thrill); second sound accentuated at base of heart; vessels not thickened. Pulse regular. Blood-pressure: Systolic, 125; diastolic, 70. No venous engorgement.

The electro-cardiogram, which shows sinus arrhythmia, is normal; there is no suggestion of left ventricular preponderance.

Orthodiagraphic record indicates exaggerated pulsation and width of aortic shadow.

Apparently the diagnosis rests on whether he has acquired damage in the shape of endocarditis following birth, or whether it is a congenital lesion. Of the latter I thought he might have either (1) a deficiency of cusps to his aortic orifice—several of which kind of case have been recorded—or (2) some deficiency of the septum which divides the truncus arteriosus in the process of development. It is difficult to do more than hazard the lesion here.

DISCUSSION.

Dr. F. PARKES WEBER said that he thought this boy had the typical "rolling-mill" murmur to the left of the sternum, specially insisted on by the late Dr. G. A. Gibson, of Edinburgh, as the most characteristic murmur of patent ductus arteriosus. In regard to the skiagram, the question arose as to why, if there were a patent ductus arteriosus, there should be a large, dilated aortic arch. Was not this a case of coarctation of the aorta in a child?

Dr. G. A. SUTHERLAND regarded this case as one of ordinary double aortic disease, but not congenital. The great hypertrophy of the left ventricle was very characteristic, and the child had a typical collapsing pulse.

Dr. PARSONS-SMITH (in reply) said that cases of congenital heart disease were often of a complicated nature but, allowing the presence of congenital disease in the case under discussion, he thought the physical signs did not warrant the diagnosis of patent ductus

arteriosus. The "mill-wheel" murmur of patent ductus arteriosus was, as a rule, confined to the upper spaces, to the left of the sternum, and it would not be conducted to the apex. In addition, the X-ray findings were against patent ductus. He was not familiar with infantile congenital coarctation of the aorta going beyond birth. The ordinary adult types, which were not very uncommon, and in whom the well-known compensatory anastomosis was established, were a different type of lesion, the coarctation taking place on the distal side of the union of the ductus arteriosus with the aorta. Dr. Sutherland thought the case was one of acquired aortic disease, and did not agree it was congenital. But he (Dr. Parsons-Smith) suggested that in the acquired disease it was unusual to feel such an extensive thrill. If the patient had a normal regurgitation at the aortic valve, with possibly some roughening causing a systolic murmur, it was extraordinary that by now he should not show by the electro-cardiogram a left-sided preponderance. His own opinion was that it was a congenital case, due probably to some error in the development of the aortic arch itself, which allowed of the production of the diastolic murmur, that murmur being the most important indication of the physical condition. He thought the condition was probably due to a regurgitant stream, possibly originating from a deficiency of the primitive septum which divided the truncus arteriosus.

Case of Arthritis of both Hips.

By B. WHITCHURCH HOWELL, F.R.C.S.

HISTORY: In March, 1913, the patient, A. B., aged 4 years, was admitted to the Queen's Hospital for Children, Hackney Road, as a case of rheumatism in both legs. Later diagnosed as tubercle of the right hip, and treated with extension and tuberculin. February, 1917: The left hip was affected. August, 1917: Subtrochanteric osteotomy of right femur.

Present condition (October 25, 1921, when seen by me): Right hip-joint: Dorsally dislocated and apparently ankylosed: flexed 30° , adducted 30° : slightly internally rotated. Scar of recently healed sinus in groin. Right knee-joint: Slight genu valgum, definite lateral mobility: range 180° to 90° . Left hip-joint: Incomplete ankylosis; flexed 40° , adducted 30° , and externally rotated. Shortening, $2\frac{1}{2}$ in. Knee-jerks: ++; ? clonus; plantar reflex, flexor. Gait: Inclined to cross the legs; walking on balls of toes, right; constantly catching them on the ground; much improved by high boot. Back: Mid-dorsal kyphosis, with marked hump 3 in. long; onset six months ago; no pain; no psoas abscess; marked increase in deformity on stooping to touch toes. Is this compensatory for ankylosis of hips?

I ask for help in making an exact diagnosis, especially concerning the left hip, and the exact line of treatment of the hip-joint which should be followed—i.e., whether I should do an arthroplasty of the left hip, or a subtrochanteric osteotomy of the right femur, or both. I should also be glad of opinions as to what is the nature of the kyphosis.

The PRESIDENT said that the walk in this case was typical of the walk generally exhibited in double ankylosis. There was, in addition to this, an increase in the roll of gait, due to adduction. Both limbs were adducted and the walk did not differ very much from that of adolescent cases of coxa vara, one leg being swung round in front of the other. It would make a very great difference in this case if the adduction could be corrected into abduction, and when both limbs were ankylosed, it was always better to have them very slightly abducted. He (the President) also thought that the kyphosis was tuberculous in character, as the patient exhibited the classical signs. He recommended an osteotomy to correct the adduction on the one side, and on the other side he thought that a pseudarthrosis would give the most useful functional result, but it was

necessary that plenty of bone should be removed. As part of the operation, it was necessary that the adductors should be divided, and this also applied in the operation for pseudarthrosis. The leg to choose upon which to do the pseudarthrosis should be the longer one, and then, following these surgical measures, the child would walk comparatively well. The tubercular curve, of course, had to be treated, and although it appeared that the activities of the disease had ended, there was so marked a curve that unless it was appropriately supported the deformity would increase from the influence of gravity alone.

Complete Transposition of Viscera with Congenital Heart Disease.

By E. A. COCKAYNE, M.D.

I. A., AGED 2 years. Marked cyanosis with clubbing of fingers and toes. Heart enlarged. Systolic thrill and murmur at right base. Electro-cardiogram by Dr. G. E. S. Ward shows in Lead I, inversion of all the waves. It is doubtful whether the girl is right or left handed. The heart lesion is regarded as pulmonary stenosis and is perhaps patent septum ventriculorum as well. Complete transposition of viscera was proved by screen examination with X-rays.

Case of Congenital Aortic Stenosis with superimposed Rheumatic Infection.

By E. BELLINGHAM SMITH, M.D.

C. B., AGED 15½ years, was brought to hospital for breathlessness. He is stated to have always been a delicate infant and is known to have had "heart disease" since the age of 3 years. At 8 years of age he was admitted to hospital for rheumatic fever. The mother is stated to have contracted venereal disease at the time of parturition.

On examination the boy is ill-developed, anæmic and breathless even at rest. The heart is enlarged, the cardiac dullness extending some 2 in. outside the nipple line. The left side of the chest is prominent and there is a marked heaving impulse. At the base, over the aortic area, there is a distinct purring systolic thrill and associated with this is a harsh loud systolic murmur, conducted up to the right clavicle and into the vessels of the neck. The second aortic sound is absent. At the apex separate systolic and diastolic murmurs are heard, suggesting an acquired mitral stenosis.

DISCUSSION.

Dr. COCKAYNE remarked that the murmur in this case could be heard without touching the chest wall.

Dr. F. PARKES WEBER commented on the rarity of cases of congenital aortic stenosis.¹ In a case of Dr. Cautley's² in which the patient died, Dr. Cautley was able to prove that it was of that nature. Dr. Bellingham Smith's case seemed to be an instance too, on the balance of evidence. He believed one or two cases of congenital

¹ F. Parkes Weber, "Congenital Valvular Defects on the Left Side of the Heart," *St. Bart's. Hosp. Repts.*, Lond., 1899, xxxv, p. 147.

² E. Cautley, *Trans. Med. Soc. Lond.*, 1900, xxiii, p. 323.

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valvular disease had been published, in which there was superadded rheumatic endocarditis after birth.

Dr. PARSONS-SMITH asked whether Dr. Bellingham Smith thought there was sufficient evidence on which to base his statement as to definite infection of the heart by the rheumatic disease which was acquired during early life. He would be inclined to be content with the diagnosis "congenital aortic stenosis," without saying there was definite evidence of mitral valve infection. There was a systolic and diastolic murmur at the mitral area. The latter he regarded as being conducted from the aortic area.

Dr. BELLINGHAM SMITH (in reply) said that there was a strong history of rheumatic fever in the case. It was unusual for a child of 8 years to have had rheumatic fever and not to have some cardiac infection. He did not think the murmurs at the apex were transmitted murmurs. In pure congenital aortic stenosis, which he did not think was excessively rare, there was not the great enlargement of heart which was seen in this case.

Hypertonic and Atonic Hearts in Children, with Radiographic Illustrations.

By C. P. LAPAGE, M.D., and W. J. S. BYTHELL, M.D.

(I) C. P. LAPAGE, M.D.

SOME three years ago, when working at the question of toxæmia and nasopharyngeal infection in children, I noticed among my out-patients an unusual number of cases of rapid heart. These cases were mostly brought for nervousness with tic or habit spasm. There also appeared to be, at the same time generally, an unusual number of cases of that trouble; it is interesting to note that this was about a year after the severe epidemic of influenza in 1918.

I therefore proceeded to examine these cases of rapid heart in detail. There was not necessarily arrhythmia; there was usually simply an increased rate of the pulse. There was no shortness of breath after exertion. There might be a tendency to breathlessness at times, but it seemed to be due more to nervous than to cardiac causes. There was in some cases præcordial discomfort, and in some a feeling of faintness at times, but heart distress was not always evident. On physical examination there was no definite irregularity; the cardiac sounds did not show necessarily any bruit, and, most important, there was no sign of dilatation. There were, however, other symptoms and signs present which pointed to excessive emotional disturbance, such as nervousness, flushings, and pallor, a marked irritability, suggesting disturbance of the sympathetic nervous system.

This condition of rapid heart without dilatation in nervous and emotional children seemed to demand more than ordinary examination if its true nature was to be detected. We were thus led to the examination of the heart by a series of tests other than the ordinary methods of clinical examination.

The tests have been worked out for children by Dr. MacSweeney, of the Physiology Department of the University of Manchester, and myself, and they show: (1) The effect of emotion on the pulse; (2) the effect of exercise on the pulse; and (3) the effect on the pulse of increased intrathoracic pressure caused by blowing a measured amount of water, representing a definite physical effort, from one bottle to another, through a tube with a narrow lumen.

In a previous paper,¹ I described "tense" and "lax" hearts, but, as a

¹ *Brit. Med. Journ.*, July 2, 1921, p. 4.

result of suggestions from Dr. MacSwiney and Dr. Bythell, the names "hypertonic" and "atonic" have been substituted.

It seemed that a series of X-ray examinations might be of great service, and, consequently, I arranged with Dr. Bythell that we should examine a series of cases in order to see: (1) whether X-ray examinations threw any light on

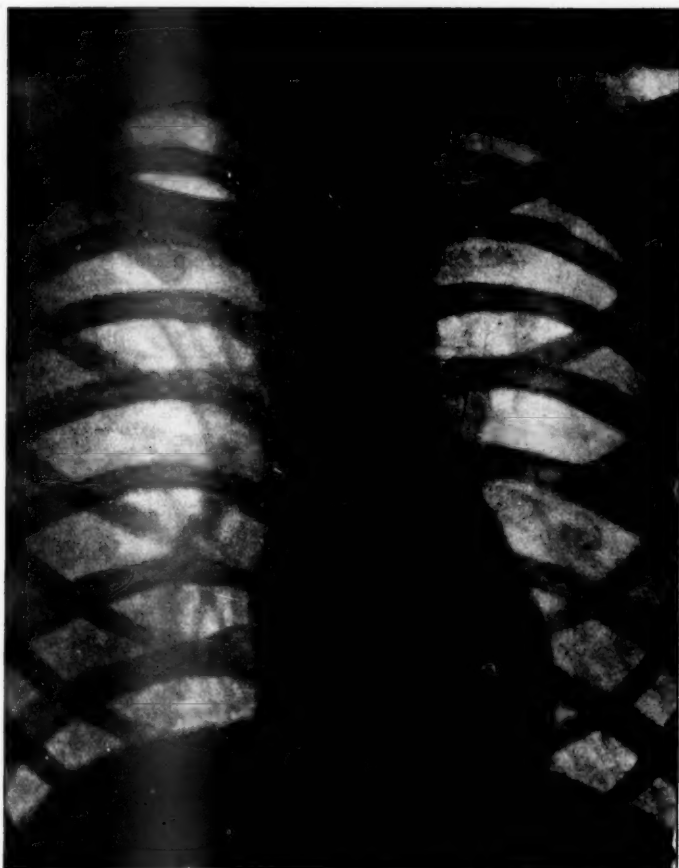


FIG. 1.—Hypertonic heart. (See description in text.)

the nature of the heart which to clinical examination is rapid without dilatation; (2) to determine the value of X-ray examination in estimating loss of tone; (3) to see whether clinical and X-ray findings agreed.

The following illustrative cases should give an idea of what we seek to demonstrate:—

*

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Case I.—Child with typical hypertonic heart. A girl, E. A., aged 12 years, had a history of influenza followed by nasopharyngeal infection. She had had growing pains, but nothing in the way of acute rheumatism or chorea. The symptoms were mainly those of nervousness; she was emotional. She flushed and paled alternately; she was irritable and subject to a facial tic. At times she had complained of pain over the heart. Physical examination showed that the pulse was very rapid, but the apex-beat was well within the nipple line and there was no bruit. Physical tests showed that the pulse

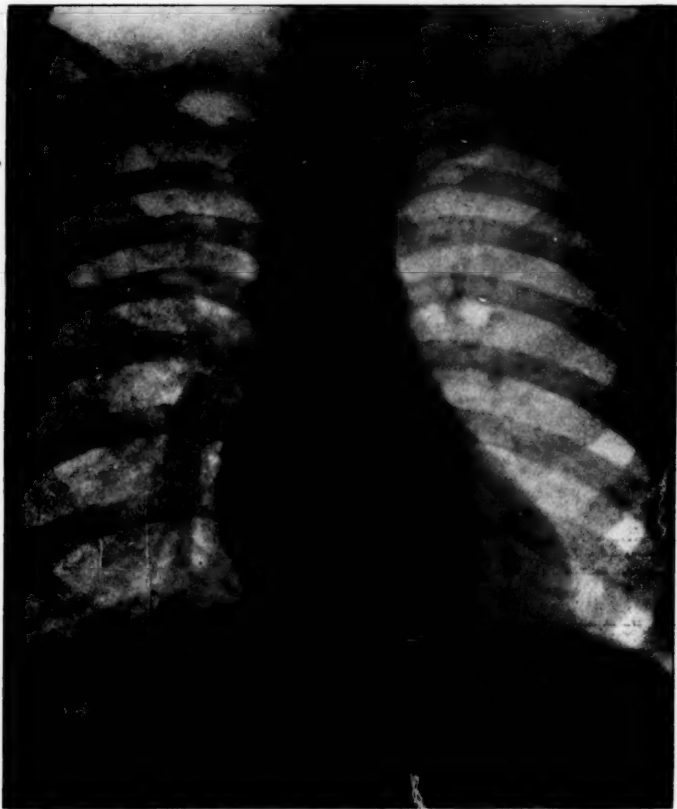


FIG. 2.—Atonic heart. (See description in text.)

slowed a little with exercise and returned to its normal rate fairly quickly. The important point was that there was no increase in the pulse-rate with exercise. The emotion test showed a quickening in the pulse-rate. The X-ray examination showed that the heart was in a condition of hypertonia (fig. 1).

Case II.—Child with atonic heart. T. B., aged 10 years. Brought with a history of a toxæmia of post-diphtheritic origin, weakness, tiredness, loss of energy and shortness of breath on exertion. The pulse was rather rapid, 120. The apex-beat was in the nipple line and there was a suggestion of dilatation. No bruits were present, though

the first sound was not clear. The emotion test showed no increase in the pulse-rate, which was rapid at the time of the test (120). The exercise test showed a marked quickening of the pulse, which went from 120 to 140 and remained quicker than its normal 120 for a little time. The intrathoracic pressure test showed no rise in the pulse-rate. The X-ray (fig. 2) shows a typical atonic appearance. Perhaps, since this case followed diphtheria, it is not absolutely typical; most of our cases of atonia followed some other form of toxemia, either rheumatic or tuberculous. The pulse-rate was also unusually rapid for a case of atonic heart.

Dr. Bythell and I have examined rather more than a hundred cases including some twenty normal cases, and have found that the physical and X-ray examinations usually agree. Dr. Bythell's plates will, I think, establish the point suggested by clinical examination, i.e., that the hypertonic state of the heart does occur. They will also show how X-ray examination can be of service in estimating degrees of atonia.

(II) X-RAY DEMONSTRATION BY W. J. S. BYTHELL, M.D.

The first radiogram is of a child aged 9 years 6 months, and this may be taken as a fairly normal heart; there is a smooth, even, convex curve on the left side, with an evenly rounded apex, and a slight bulge to the right of the spine.

The next also shows a normal heart. All the skiagrams were taken by instantaneous exposure, and this child was somewhat nervous, and looked over his right shoulder at the time, so that the right side is practically in line with the edge of the spine; otherwise it is a normal heart.

In the next you see the heart beginning to show a certain amount of atony; the heart is commencing to sag a little. You will see in some of the later skiagrams that, as there is more atony the outline of the left side becomes concave, and the heart spreads out laterally. In extreme atony there may also be a concave curve on the right side.

Here is a picture of the heart in extreme atony; the heart is comparable to a rubber bag which has been punctured when inflated, and is beginning to settle down, giving an impression of there being extremely flaccid and flabby muscle.

The next also shows an atonic heart; in this case there is a greater bulge to the right, and it begins to sag out a little on the other side.

Here again is an atonic heart; there is extensive tubercle of the hilus, in both roots, extending a good deal downwards.

The next, similarly, is somewhat atonic, but I have seen some which were much more atonic than this; we have not been looking out for extreme atony. In this there was a systolic bruit, and dilatation of the whole heart, the organ assuming a globular shape.

This is a diagram I have made. The radiogram is of the normal heart. The red line shows the change which is produced by the atony. I have seen cases which sagged even more. The white line represents the conditions we have spoken about to-day, i.e., over-contraction of the heart, with straightened outlines and a shortened transverse diameter.

The next I show you are examples of the over contracted or hypertonic heart. In this one the heart is becoming elongated; it has a narrow outline.

The next shows another example of the long, triangular shape which you see in this condition. In this case there was old hilus mischief, which is now more or less quiescent; it is chiefly a fibrosis of both roots.

I now show you a number of instantaneous radiograms of the normal, atonic and hypertonic heart.

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In contrast with the rounded outlines of the normal heart, the atonic show signs of sagging, as though the heart were becoming flattened out upon the diaphragm, like a punctured rubber bag that is beginning to collapse; in extreme cases the outline of the upper part of the left ventricle is seen to be concave instead of convex.

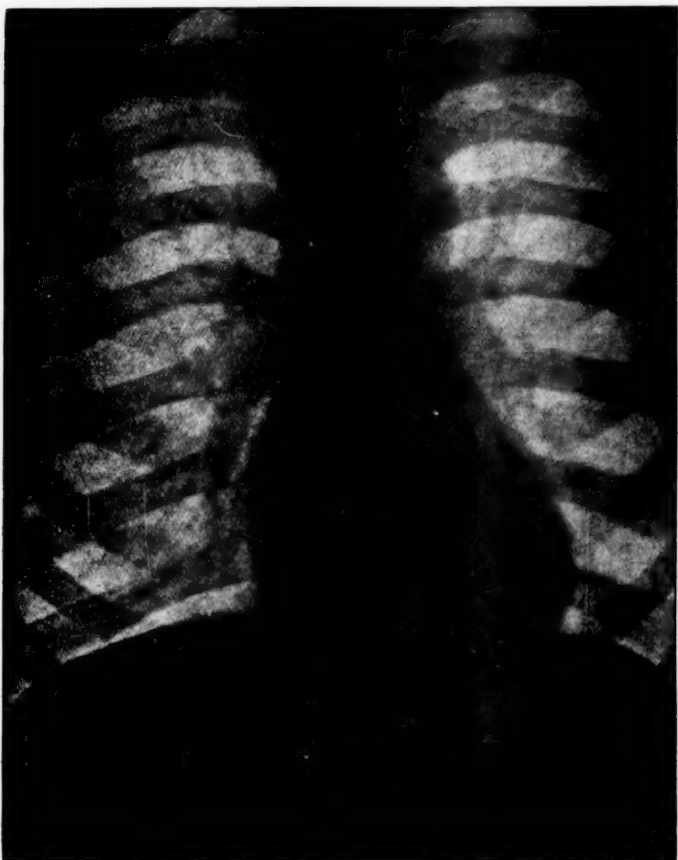


FIG. 3.—Normal heart. (See description in text.)

The radiograms of hypertonic hearts reveal exactly the opposite condition, the whole organ being so contracted that the transverse diameter is considerably narrowed. In one of the cases shown upon the screen the hypertonic contraction was extreme. A second radiogram, taken some ten months later, showed a return to the normal rounded shape, with an increase of $\frac{5}{8}$ in. in the transverse diameter (see fig. 3).

(III) C. P. LAPAGE, M.D. (*continued.*)

With reference to the last slide which Dr. Bythell showed you, of the heart which was first in the hypertonic state and later on became atonic, the cause for the change in this heart was a definite attack of chorea. The phase of atonicity caused by the chorea and its accompanying infection disappeared later, and the heart returned to the normal state (fig. 3).

The next radiogram shows a hypertonic heart from a child who had nervous signs which were due to a chronic nasopharyngeal infection. A swab of the nasopharynx showed first, diplococci, and diphtheroid organisms. But as a result of treatment with an autogenous vaccine, the diplococci disappeared, and diphtheroid organisms were found remaining in the swab.

This child had steady treatment with autogenous vaccine, and has now improved very much in consequence. Her heart has settled down and she is losing both her emotional and her nervous signs.

Our main object has been to show that this condition of hypertonic heart occurs in children. We have naturally, like others,¹ considered the reason for its occurrence, as to whether it is a muscle condition or a nerve condition and if the latter, whether it is caused by vagal upset, or by sympathetic upset or by both. It seems likely that the atonic heart is a muscle condition due to toxic effects on the muscle, while the hypertonic heart is a nervous condition due to a toxæmia which picks out the nervous tissues controlling the heart. Very likely the sympathetic nervous system is largely at fault in the causation of this condition of hypertonic heart.

I have certainly noticed some relation between an outbreak of influenza some months before and the frequency with which we meet with these cases of hypertonic heart in children. I have not been able to establish a definite enough connexion to prove my case, but the connexion is extremely likely.

I have tried the effect of belladonna and also of adrenalin, but not sufficiently often to obtain tangible results.

Another point to be considered is, whether the condition is due to deficiency in any endocrine gland. With regard to this it is interesting to note that the three cases who showed signs of early Graves' disease all had typical hypertonic hearts on X-ray examination. So far as my experience of any endocrine gland treatment has gone, I have not noticed much improvement in any cases with thyroid treatment, but I have had a certain amount of improvement in some cases by dosage with combined tablets as follows, consisting of:—

R	Thyroid extract	...	...	2 gr.
"	Suprarenal extract	...	...	$\frac{2}{3}$ gr.
	Pituitary extract	...	...	$\frac{1}{4}$ gr.

and in some cases I have noticed a little improvement under the use of parathyroid extract, $\frac{1}{20}$ gr. twice a day. Still I have not tried these measures in a sufficient number of cases to form any definite conclusion.

It is very difficult to understand why some cases should develop hypertonic heart with tachycardia, while others should develop the atonic heart with signs of dilatation. Both of the conditions seem to be due to a toxæmia, and different organisms may pick out different tissues in exercising their toxic effect. It may also be that those who develop the hypertonic heart have a nervous system which reacts readily to a toxæmia and shows signs of distress in the way of nervous signs; the other child who develops an atonic heart

¹ See Sutherland, *Quart. Journ. Med.*, 1919, xii, p. 183; Coombs, *Med. Annual*, 1921, p. 243.

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does so because the toxæmia seems to select muscles. Certainly the rheumatic toxæmia (which includes chorea), seems to affect muscles and ligaments, and, together with the atonic heart, gives rise to other atonias such as flat-foot and scoliosis.

Treatment.—Our treatment of the atonic heart cases is that of rest and the prevention of strain, so that we avoid the development of mitral disease. Our treatment of the hypertonic heart, on the other hand, is to allay nervousness and irritability. Apart from any temporary atonic phase, the hypertonic heart is quite able to undertake a certain amount of exercise; in fact, it is often improved by exertion, the beat becoming less rapid as a result. Therefore, games and exercises which help to take the child out of itself are of advantage. We must, of course, at the same time study any cause of toxæmia and try to remove it, as in the case of the girl with nasopharyngeal infection to whom we were administering an autogenous vaccine.

The condition of hypertonic heart which we have tried to demonstrate in this paper is a very important one, and it is clearly of great value to distinguish it from the atonic heart. It is important not only for physicians, but also for those engaged in School Medical Inspection, because inspectors may often find cases of hypertonic heart in children who are not thought ill enough to be sent down to a hospital for consultation.

DISCUSSION.

Dr. E. BELLINGHAM SMITH thought this condition could be definitely placed among the functional nervous disorders of childhood, and regarded this hypertonicity as part of a general tendency to spasmodic affections. Infections, he agreed, would explain the atonic conditions.

Dr. G. A. SUTHERLAND said that the demonstration showed hearts which were larger and hearts which were smaller. He (Dr. Sutherland) could not see evidence of want of tonicity in the larger hearts, nor any hypertonicity in the smaller ones. The physiologist told them that if a heart had more work to do, it dilated for that purpose and the contractions became more powerful. The mere presence of dilatation did not mean that the particular heart was atonic; it simply meant the heart was responding to a call for more work. The size of the heart depended much on the venous inflow, and in the production of heart enlargement there were many factors. For many years there had been discussions on atony and hypertony of the stomach. He thought the heart, like the stomach, was capable of taking up many different forms; it might lie in the thorax in many different ways. There was a wide range of change in the heart to be allowed for, as in the case of the stomach. It was necessary for Dr. Lapage, in this investigation, first to ascertain what were the physiological changes in the heart; it must not be assumed that because it took on a different shape, there was a pathological process going on. With regard to the rate, if the heart-rate increased the organ became smaller and its outline was altered. And the clinical facts in each case brought forward must be correlated with the skiagram. It was not sufficient to take one instantaneous photograph of each child and draw conclusions from it; many skiagrams should be taken, over a period of 12 hours or so.

Dr. PARSONS-SMITH asked whether Dr. Lapage had considered the particular cycle the heart happened to be in when the skiagrams were taken.

Dr. LAPAGE (in reply) said that he agreed the condition shown might not be due to loss of tone. When the heart was beating more quickly it was smaller, and the dilated heart which was beating slowly might not be atonic. But he had the clinical correlation in each case, though the lateness of the hour did not permit of his giving it. Children who had shown atonic hearts had had other signs of toxæmia, such as loss of tone, scoliosis and lax ligaments; these children were usually in a generally atonic and toxæmic state. Further data might be required to prove that a true hypertonia was

present in the condition described as "hypertonic heart." But the subjects of this trouble were not normal; they were in a state of extreme emotion, they were "jumpy" and excitable, and in a state of tenseness. There was no atonia about them. He considered the condition was also due to an infection, but the toxæmia acted on nerves rather than on muscles. With regard to the noting of the stage in the heart's cycle when the skiagrams were taken, his colleague and himself always watched the heart on the iridescent screen over a number of beats, and they found that the stage of the heart-beat made practically no difference to the estimation as to whether the heart was hypertonic or atonic. In answer to Dr. Sutherland, Dr. Bythell and he had already considered the question of examining cases by the X-ray screen both before and after exercise, and they hoped later to have more information to offer.

Case of ? Dyspituitarism, ? Hypernephroma.

By E. BELLINGHAM SMITH, M.D.

N. F., MALE, aged 19 years. Came to hospital complaining of pain in sides, back and hips. He states he has always been short and fat since infancy.

On examination: A very stunted obese youth, with a bloated and plethoric countenance. The cranium is small, and the face broad with prominent cheek bones; there are numerous small stellate veins on the cheeks, and the lips are slightly livid. There are rolls of fat round the neck which form three double chins. The trunk has a deep covering of fat, the breasts are pendulous like those of a woman of 40, and the abdomen is enormous. On the lower surface of the abdomen there are a number of bluish red striæ, like lineæ gravidarum. There is a slight development of pubic hair. The left testis is small and rudimentary and the right absent. The penis is small and retracted. There is slight œdema of the feet. The mentality is fair. The voice is high pitched and shrill like that of a boy of 8 years. Vision appears good. There is no contraction of the fields of vision and the fundi appear normal. The pupils are widely dilated and react sluggishly, if at all, to light. The urine contains 6.5 per cent. of sugar on his ordinary diet. The systolic blood-pressure is 218 mm. An X-ray of the skull shows little or no change in the region of the sella turcica.

This case is brought to obtain the opinion of the members of the Section as to diagnosis and treatment. I thought at first that with his sexual infantilism and obesity he might be a case of Fröhlich's syndrome, but that supposition appears to be negated by the presence of sugar in the urine. Against the diagnosis of cortical suprarenal tumour is the long duration of the condition and the absence of sexual precocity. On the other hand his curious plethoric countenance, the obesity and glycosuria, and possibly his widely dilated pupils are of suprarenal origin. With these signs he complains of radiating pain round the waist. Possibly some general atrophic condition of his pituitary body may explain the condition. On the basis of the latter supposition, I am giving him extract of the whole gland.

DISCUSSION.

Dr. G. A. SUTHERLAND asked, on account of the peculiar complexion, whether polycythæmia was present. He did not think this sort of complexion was commonly associated with pituitary conditions, but it was seen in cases of hypernephroma. Had Dr. Bellingham Smith examined the patient for a tumour of the suprarenals? The late Dr. Leonard Guthrie described this kind of case as that of the "public-house loafer."

26 Bellingham Smith: ? *Dyspituitarism*, ? *Hypernephroma*

Dr. F. PARKES WEBER did not consider this boy was an example of Fröhlich's syndrome—i.e., "dystrophia adiposo-genitalis." The latter patients were nearly always pale-faced and flabby, and had a deficiency of hair. This fat boy appeared very plethoric; the striae atrophicæ, and, as the exhibitor said, the presence of glycosuria, were against Fröhlich's syndrome. The abdominal distension in this boy was not entirely due to fat, and there was œdema of the legs, which might be due to an abdominal tumour. But, with such a large abdomen, he did not think a suprarenal tumour could be felt, even if one were present. He regarded cases of this type as much rarer than those of Fröhlich's syndrome. Dr. G. F. Still, in 1901, showed a case which, in general appearance, was a match for the present one, but no post-mortem examination was made on it.¹ He hoped that a blood count would be made in regard to the possible presence of polycythæmia rubra. In regard to the "plethoric obesity" type of suprarenal case (hypernephroma), the appearance of the affected children was compared by Dr. Leonard Guthrie to the coarse plethoric appearance of fat, middle-aged farm-hands much exposed to the weather. The term "precocious obesity" had been used by himself (Dr. Weber) in regard to such children.

Dr. LAPAGE referred to a case under his care of a girl who became excessively obese—so much so that she was not able to go out as people made fun of her appearance. He could not find any intracranial abnormality; all he could discover was a suggestion of a tumour in the left renal area, with slight tenderness there. As she had slight notching of the teeth, he had a Wassermann test done and it was positive. He gave her anti-syphilitic treatment. After this he tried thyroid extract, but she did not lose weight. He then tried a combination of thyroid, suprarenal and pituitary, and she began to lose weight rapidly and became normal. He had seen her again two or three days before, and had found she had re-commenced to put on weight. She had, however, been having less gland extract and probably with a resumption of full treatment she would improve again.

Dr. BELLINGHAM SMITH (in reply) said he had suggested to a colleague that it might be a case of suprarenal tumour, but he dismissed the idea because of the age of the patient and of the fact that the condition had existed practically since birth.

¹ G. F. Still, *Trans. Clin. Soc. Lond.*, 1901, xxxiv, p. 243 (a boy, aged 7½ years).

Section for the Study of Disease in Children.

President—Sir ROBERT JONES, K.B.E., C.B., F.R.C.S.Ed.

Specimen from a Case of Aneurysm of the Ductus Arteriosus.

By ROBERT HUTCHISON, M.D.

THIS case will be published in full in the *British Journal of Children's Diseases*, April-June, 1922.

Dermato-polyneuritis (Acrodynia: Erythroedema).

By HUGH THURSFIELD, M.D.

(In collaboration with DONALD PATERSON, M.B.)

(ABSTRACT.)

[Published in full in the *British Journal of Children's Diseases*, January-March, 1922, xix, p. 27.]

A GIRL baby was sent to me at the Hospital for Sick Children at the beginning of February, 1922, with the history that she had been breast-fed up to the age of 8 months, and during that time and for the ensuing month she had been a normally healthy child, indeed unusually advanced for her age. On December 19, 1921, she became ill, had some vomiting for three days and was feverish. After a few days' interval in which she seemed to be normal, and a bright cheerful child she became fretful, whining and disinclined for food. She remained in this condition till the beginning of February when desquamation of the hands and feet began abruptly with redness and swelling of the affected parts. In this condition I saw her, and suggested a diagnosis which proved to be wrong. The history of an illness six weeks previously with the subsequent wasting, desquamation, and, as we found, some albuminuria, conveyed the impression that she had had an attack of scarlatina. At this time though she was fretful and much wasted she had none of the mental symptoms which subsequently developed.

During the next three weeks the severity of the skin lesions waxed and waned, but the chief changes were the rapid alterations in the mental and muscular systems, the result being a mental condition which at first suggested an encephalitis and a muscular condition which resembled extreme hypotonia. It was stated by her mother that she moaned and screamed all day and hardly slept at night, that she was tremulous, that her eyes rolled and that three days before I saw her a second time she had squinted. I saw her again on March 2 and at once recognized that my previous suggestion had been an error and that I was confronted by an affection with which I was unfamiliar. She was admitted to the Children's Hospital in the hope that some of my colleagues might recognize the disease.

Her appearance was at this time striking. Her face showed two patches of high colour on the cheeks and a reddened nose; with a patch of branny desquamation on the forehead. She had two small shallow ulcers on the dorsum of the tongue, but her mouth was otherwise clean, with teeth (sixteen in number) and gums normal. The fauces and tonsils were normal; she had no anæmia and no evidence of rickets. The hair was thinned over the scalp, especially over the right parietal area. She had a slight erythematous rash

on the buttocks. Her mouth was frequently opened widely, with a gape resembling that of a young nestling.

The extremities were cyanosed, slightly cedematous and cold, with the skin peeling off in large flakes from the fingers and toes. The finger-nails were not affected, but the toe-nails appeared to be deformed by the inflammation. The redness, cyanosis and desquamation were limited to the hands and feet, and faded off quickly so that above the wrists and ankles the skin had a normal appearance. There was an offensive mouse-like smell reminding me of the smell of favus. These skin lesions obviously caused her a good deal of annoyance though she did not scratch or rub them so furiously as a child with eczema does. Her general condition with the exceptions to be described was good, though she was obviously wasted. She swallowed well and took food readily, and her bowel actions were normal. She had no fever and her pulse-rate varied from 90 to 100.

She had no paralysis; all movements were performed but the tonelessness of her muscles was striking. She was able to hold up her head, and even to sit up, with marked lordosis, but tended to fall unless supported. She could raise herself into a sitting position with some difficulty; but was quite unable to stand or to bear her weight on her legs. All her movements were performed with extreme slowness, but there was no tremor and there was no inco-ordination. When awake—and she slept very little even at night—she kept up a slow continuous movement, falling forward on her face, and then after a few moments slowly raising herself into a sitting position with a circular movement to the left. The legs were moved very little, most of her movements being confined to the trunk, arms and head.

When her attention was attracted she appeared to take an intelligent interest, but after a few moments an expression of pain was shown on her face by a contraction of the muscles and a low cry with the wide gaping movement of the lower jaw. She would grasp an object in her hands but would let it fall shortly.

The reflexes were all present and normal except that on a few occasions the left plantar reflex was definitely extensor. Occasionally also there appeared to be some spasmodic rigidity of the legs and arms, but this was momentary and ordinarily the limbs were unusually lax and hypertonic. The electrical reactions were normal.

Sensation in so young a child, and in such a condition, is exceptionally difficult to estimate, but we formed the opinion after many trials that in the extremities from the elbow to the fingers and from the knee to the toes sensation to a pin-prick was distinctly defective. She appeared to feel a pin-prick on the body and face normally, though she seemed to be insensitive to a prick in the ear for a blood-count.

The cerebrospinal fluid was quite normal. There was no change in either ocular fundus and the squint noted by her mother was not seen in the hospital. Her blood-count showed: red-blood corpuscles, 5,127,000; white-blood corpuscles, 18,200; hæmoglobin 90 per cent. The polymorphonuclear cells were 58 per cent.—10,500, and no abnormal leucocytes were observed. There were no diphtheria bacilli in a swab taken from her nasopharynx, and no abnormal organisms in the stools.

SUMMARY.

A previously healthy child is suddenly attacked by an undiagnosed, probably febrile, infection; after some weeks of ailing, fretfulness and anorexia she develops marked skin, neuro-muscular, and mental symptoms; with a

tendency to exacerbations of the skin lesions from time to time. The condition is stationary or possibly slowly improving.

Neither the name "acrodynia" nor that of "erythroedema" seems to us to be sufficiently descriptive, and we have ventured to use the term "dermatopolyneuritis" as being more expressive of the chief phenomena of the disorder.

Postscript.—Since the foregoing account was written the child has died of an acute intussusception.

Erythroedema.

By F. PARKES WEBER, M.D.

THE paper is published in full, with illustrations, in the *British Journal of Children's Diseases* for January to March, 1922, p. 17.

Case of Double Inguinal Hernia in which both Sacs were removed through a Single Transverse Suprapubic Incision.

By PHILIP TURNER, M.S., F.R.C.S.

C. G., AGED 2 years 2 months, was admitted to hospital on February 12, 1922, for double inguinal hernia. At the operation a transverse incision, about 3 in. in length, was made about 2 in. above the pubes. The sheath of the rectus was exposed and the skin and superficial tissues were undercut so that on retraction the aponeurosis of the external oblique was exposed on either side as far as Poupart's ligament. The left side, on which the hernia was the larger, was first dealt with. The method employed for the removal of the sac was one which I described before the Section in 1912.¹ An incision was made through the external oblique, over the internal abdominal ring, and the lower margin of the internal oblique was then drawn up so as to expose the sac and the spermatic cord just below the internal ring. After these structures had been freed and drawn through the incision in the external oblique, the sac was separated from the cord and isolated up to the internal ring. Below, it was found to be continuous with the tunica vaginalis, so that after it had been ligatured above, a second ligature was applied where it joined the tunica vaginalis, and the intervening part removed. The testicle, which had been pulled up into the wound, was then pushed back along the inguinal canal into the scrotum, and the incision in the external oblique was closed. The superficial tissues were then retracted to the right and a hernial sac of considerable size, but not continuous with the tunica vaginalis, was removed by the same procedure as that employed on the opposite side.

The advantages of this operation are that the wound is well away from the groin, and that it is in a favourable position for subsequent dressings and nursing. The incision is particularly useful for those cases in which there is a definite hernia on one side, while, on the other, there is perhaps a slight swelling or a doubtful history of the occasional appearance of such a swelling. In this case the definite hernia can be treated and the other inguinal canal be explored for the presence of a sac.

¹ *Proceedings*, 1912, v, pp. 135-137.

Case of Exophthalmic Goitre.

By E. BELLINGHAM SMITH, M.D.

K. M., GIRL, aged 13 years 9 months, was taken to a throat hospital a year ago, on account of some difficulty in swallowing. There was swelling in the neck, and three months later exopthalmos developed. She now has exophthalmos, a large goitre, and a pulse-rate of 120 to 140; is nervous and emotional, and has attacks of palpitation. There is a fine tremor of hands.

DISCUSSION.

Dr. E. BELLINGHAM SMITH: I think this is one of the rare diseases of childhood, but there is much difference of opinion on this matter evident in the text-books. In most text-books on children's diseases exophthalmic goitre is not mentioned, and those writers who do mention it regard it as a rarity. It is stated in Allbutt and Rolleston's "System of Medicine," in the article on exophthalmic goitre, by Dr. Hector Mackenzie,¹ that of 500 cases of exophthalmic goitre thirty-eight were 10 to 16 years of age, and fifteen under 10 years. I think that statement must be a great error. In the *Reports of the Society for the Study of Diseases in Children*, from 1900-08, there were recorded only three cases of exophthalmic goitre in children, one in a child 3 years of age, who died, aged 6 years; the other two in children 12 years of age. I shall be glad to have advice as to how to deal with the child, and also to hear remarks as to prognosis.

Dr. G. A. SUTHERLAND agreed that, according to experience, this disease was rare in early life. He recalled the case of a child who had had numerous attacks of chorea, and every time she had these attacks her thyroid became enlarged. At the age of 13 years she passed into a condition indicating exophthalmic goitre. The symptoms developed acutely, and she died with all the signs of the disease. The case now shown he regarded as somewhat mild, as the pulse was quiet. If it were acute, the prognosis, at that age, would be very grave. Was there rheumatism in the present patient? The mother said the child had had pains about the limbs, but he could not find evidence of acute rheumatism. Chorea in children might, later in life, pass on to exophthalmic goitre; he regarded rheumatic infection as a factor predisposing to exophthalmic goitre and chorea.

Dr. CAUTLEY (Chairman) agreed that cases of exophthalmic goitre were rare in children, in spite of some of the recorded statistics given. The statistics were probably based on the fact that an enlargement of the thyroid and hyper-excitability with tremor, especially in girls at about puberty, were frequently seen in children. He agreed with Dr. Sutherland that this was a mild case, but it nevertheless showed definite exophthalmos. His view as to the prognosis was favourable, especially as the child was well nourished; prognosis was particularly bad in cases showing marked wasting.

Specimens from the Case of Obesity (? Dyspituitarism, ? Hypernephroma), shown at last Meeting.²

By E. BELLINGHAM SMITH, M.D., and R. DONALDSON, M.B.

(I) REMARKS BY DR. E. BELLINGHAM SMITH.

I WAS asked at the last meeting for a further report if anything should happen in regard to this case, which I then regarded as one of dyspituitarism. Dr. Sutherland and Dr. Parkes Weber considered it to be a case of hypernephroma, remarking that it belonged to the group which the late Dr. Guthrie

¹ Allbutt and Rolleston, "System of Medicine," iv, Pt. I, 1908, p. 359.

² See *Proceedings*, p. 25.

described at some length in the *Transactions of the Clinical Society*.¹ This patient was admitted to hospital in order to see if, like a diabetic, he would react to starvation diet; the result was that on the fifth day of this diet there had been no reduction of the sugar, and there was a large increase in the diacetic acid and acetone. He was threatened with diabetic coma, and became drowsy, so we put him back to full diet. He recovered for three or four days, then had convulsions, and died.

(II) REMARKS BY DR. DONALDSON.

There was an incipient moustache, and the hair had a feminine distribution. On the trunk, at the level of the umbilicus, the fat had a depth of $2\frac{1}{4}$ in. There were dilated veins, and multiple small hæmorrhages under the skin. The brain weighed 2 lb., and the pituitary gland appeared to be normal; its weight was 0.65 gm.; the pineal gland was small: weight 0.068 gm. No macroscopical lesion was discovered. No thymus could be found, but an enormous pad of fat covered both lungs. The aorta was hypoplastic. The suprarenals were slightly larger than normal, and their weights were, respectively: right, 12.5 gm.; left, 13.5 gm., very soft and flabby. There were no cortical nodules. Near the hepatic flexure there was, in the transverse mesocolon, a small nodule, half of which has been exhibited. It was firm, and on section it was seen to consist mainly of blood. There was no yellow mottling. There were pale areas of degeneration and necrosis. The section shown was that of the cells which had been least damaged. Extending from that nodule upwards over the superior surface there was a quantity of brownish fluid, and, adherent to the liver, greyish, putty-like material, evidently altered blood-clot. A similar, but smaller, nodule was found near the head of the pancreas, but not in it. The pancreas itself showed pale areas of necrosis, and in the fat round the pancreas were areas of fat necrosis. The testicles were infantile, and weighed 2.5 gm. each. They showed considerable fibrosis, very few interstitial cells, and no evidence of spermatozoa formation.

DISCUSSION.

Dr. F. PARKES WEBER said that the growth which had been discovered might be a hypernephroma. Two kinds of growth often associated with an extreme amount of blood, and consisting of very friable material, were malignant chorion-epithelioma and very vascular hypernephroma. There was no evidence that this was chorion-epithelioma. He thought it was a case of hypernephroma, growing from a misplaced portion of suprarenal gland tissue, and that a final hæmorrhage had caused destruction of the structure of the tumour.¹ Diabetes mellitus might have been, in this patient, a super-added disease.

Dr. BELLINGHAM SMITH (in reply) said that at present he agreed with Dr. Parkes Weber that there was a hypernephroma, and that the tumour was in an accessory suprarenal.

Case of Hemiplegia.

By B. WHITCHURCH HOWELL, F.R.C.S.

THIS boy, aged 11 years, had traumatic hemiplegia probably when he was born. His previous history is not available. He came to me because of right

¹ *Trans. Clin. Soc. Lond.*, 1907, xl, pp. 175-202.

² Cf. F. Parkes Weber, "The Diagnosis of Suprarenal Tumours, especially in regard to Blood-pressure," *Practitioner*, London, 1920, cv, pp. 181-185; the last case mentioned in the paper, in which the brachial systolic blood-pressure was 205-220 mm. Hg.

hemiplegia, and it was discovered that he had a depressed fracture on the left side of his skull. He was intelligent, and appeared to have had no fits; therefore, thinking he might improve, I tried re-education first; then, last November, I removed the depressed fracture. There has been distinct improvement since, but there still remains a definite hemiplegia of the right upper limb which requires correction. I brought him forward to ask surgeons present whether he ought to have an operation on the peripheral motor nerves. I propose to divide a certain portion of the fibres of the median nerve, going to the pronator radii teres, and to explore the musculo-spiral nerve to see if he has apparent paresis of the extensors of the wrist and fingers. If so, instead of dividing some of the motor nerve fibres going to the flexors of the fingers, I propose to transplant one or more of the flexor group to the extensor aspect of the wrist and fingers, to try to give him power to dorsiflex the wrist and fingers. The difficulty is that he is *apparently* in a paretic condition; it is not a typically spastic hand condition. I have asked the opinion of Mr. Fairbank, and he thought I could do no more than divide the motor nerves going to the pronator radii teres, and so getting better supination of the hand. I ask for opinions as to whether there is paralysis of the extensors.

Case of Hydatid of Pleura and Lung in a Boy, aged 8 Years.

By R. C. JEWESBURY, M.D.

THE patient was sent to hospital with a history of having had a "chill" about five months ago, and afterwards he had complained of pains in the back and chest. Two months ago he was seen by his local doctor who diagnosed "congestion of the lungs" at *left base*; this was thought to be followed by an empyema and he was sent to hospital.

When first seen at hospital he appeared to be well nourished but was rather pale. Respirations 28, pulse 92, temperature normal. There was a large area of dullness at the left base with some pleural friction in the upper part of the left axilla. The heart was displaced slightly to the right. Breath sounds, vocal resonance and fremitus were diminished over the dull area. The note on percussion was impaired as were also the breath sounds over a fairly large area at the right apex. The left chest was explored and a syringe-ful of a perfectly clear colourless fluid, looking like water, was withdrawn; the report on this fluid was that it contained "no cells."

Patient was admitted to hospital and a blood examination was made with the following results: red cells, 4,250,000; hæmoglobin, 64 per cent.; colour index, 0.8; white cells, 5,680; polynuclears, 60 per cent.; eosinophils, 6 per cent.; lymphocytes, 30 per cent.; large hyalines, 4 per cent. The left chest was then aspirated and 200 c.c. of fluid thrown off. This fluid was slightly opalescent and contained shreds of lymph-like material. The report from the Pathological Department on this fluid was as follows: "Fluid aspirated from chest contains scolices of *Tænia echinococcus* in large numbers. Hydatid complement fixation reaction, weak positive. Precipitin reaction, weak positive."

The accompanying skiagrams by Sir Archibald Reid (figs. 1, 2) show the condition of the chest before and after aspiration; it will be seen in the second skiagram (fig. 2) that the shadow at the left base had entirely disappeared.

I made an attempt to aspirate the cyst at the right apex posteriorly, but



FIG. 1.—Showing hydatid cyst at left base and at right apex.



FIG. 2.—View of chest after aspirating cyst at left base.

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as I did not strike it easily I decided it was safer not to make further attempts by this method. The eosinophilia increased from 6 to 10 per cent. after the aspiration of the left chest.

The patient has lived in this country all his life, and no dog was kept in the house.

Hydatid disease particularly of the lung or pleura, is comparatively rare in children in this country.

At St. Thomas's Hospital during the past fifteen years there have been in all twenty-one cases—of these seven in males and fourteen in females; the ages varied from 19 to 60 years with one female child aged $3\frac{1}{2}$ years, who had a hydatid cyst of liver. The cases were as follows: Hydatid in liver, sixteen cases; hydatid in lung, two cases; hydatid in kidney, one case; hydatid in peritoneum, one case; hydatid in spinal cord, one case.

I should be glad to hear any suggestions as to treatment in this case.

Mr. B. WHITCHURCH HOWELL said a 1 per cent. solution of formalin was of use sometimes in hydatid cyst occurring in other parts of the body; it was used to swab out the cavity after it had been opened.

Case of Generalized Muscular Hypertrophy in a Boy, aged 10 Years.

By R. C. JEWESBURY, M.D.

THE state of the patient was first noticed by the school medical officer, and he was sent up to hospital as a case of ? facial paralysis. He is said to have been "always an ailing child." He began to walk at 2 years, and is very backward mentally. He has a difficulty in speaking, and speech is accompanied by spasm of the facial muscles. There is no facial paralysis. He is unable to protrude the tongue to the full extent. There is no evidence of disease in the central nervous system. He has always been of a lazy disposition and does not care about games at school.

Family history: He is one of nine children, all the others being normal. The parents are normal. There is an extraordinary condition of hypertrophy of all his muscles, but this is particularly marked in the muscles of the shoulders, arms, chest and back. When stripped he looks like a young prize-fighter. It appears to be a true hypertrophy, for his strength is in proportion to his muscular development. His weight is 3 st. 13 lb., and the bones are normal for his size. There is no abnormality of sexual development. A skiagram of the base of the skull shows a perfectly normal sella turcica, and there are no eye changes.

DISCUSSION.

Dr. F. PARKES WEBER said that (apart from the question of the "Infant Hercules" type of child) the case might turn out later on to be one of primary muscular disease of the class of Thomsen's disease.

Dr. CAUTLEY (Chairman) thought that this case was more of the "Infant Hercules" type. It would be instructive if Dr. Jewesbury were to show the patient again in a year's time.

Section for the Study of Disease in Children.

President—Sir ROBERT JONES, K.B.E., C.B., F.R.C.S.

The Treatment of Paralysis in Children :

PRESIDENT'S ADDRESS

By Sir ROBERT JONES, K.B.E., C.B., Ch.M., F.R.C.S.

A BODY such as this Section of the Royal Society of Medicine is of inestimable value in bringing together the physician and the surgeon in their manifold activities, and I would emphasize again that a specialism should be attained by a process of mental evolution, and be practised only after a thorough grasp of the fundamental principles of medicine and surgery has been won. Even now there should be a closer association between the work of the physician and that of the surgeon; they are not practising two different arts, and in a large number of cases their combined energies should be devoted to a common end.

On a visit recently with Sir Anthony Bowlby to one of the hospitals in the United States we were impressed by the fact that Harvey Cushing and his class went round the orthopaedic wards with Lovett and his class, and a return visit was paid to the neurological wards. Problems of common interest were discussed and valuable suggestions made. It would be to the common good if physician and surgeon in our teaching hospitals, with their students, could meet in common in the wards. The surgeon, if he is receptive, has always something to learn from the physician, and the physician may sometimes glean a stray idea from the surgeon. Take a group of cases with potential deformity, say the osteo-arthritis group. The surgeon with his mind obsessed by deformity is very apt to think that his whole duty is to correct it, and no serious attempt is made to check the infection: while the physician may ignore the sure onset of deformity in his eagerness to discover a microbe. This is all wrong. If we walk round a ward where such cases abound we find ankylosing ankles in full extension, flexed knees and hips, and crooked spines. Yet all these are preventable. The student who becomes the practitioner is encouraged to look upon such results as the inevitable sequence of disease with far-reaching evil effect. A closer affiliation between physician and surgeon would obviate all this; the applied knowledge of each is essential to the scientific conduct of the case. The practitioner in the remote village would then know that such cases have both a medical and a surgical aspect, and, as he has to practise both as a physician and a surgeon, the knowledge would relieve him of serious responsibility. Medical sins of omission and surgical sins of commission, would both be prevented by a closer affiliation of these great branches of our profession.

I propose to deal with some points in the treatment of the paralyses in children, affections which require the close association of neurologist and surgeon. Poliomyelitis is the most common of the paralytic affections attacking the child, and yet it is not sufficiently emphasized that this affection may not be accompanied by paralysis. Paralysis is incidental, not essential.

The many and very extensive epidemics that have occurred in America, and their careful tabulation by Lovett and others, confirm the conclusion of observers in other countries that there is considerable variation in the onset, although, generally speaking, it is that of an acute infection. I can recall several instances in which I have failed to obtain any history of an acute beginning. In one remarkable instance three children were affected in one family. In one of the children extensive paralysis followed an acute onset; in another the acute onset was followed by pain, but no evidence could be gathered of even a transient paralysis; in the third child extensive paralysis occurred suddenly, with no febrile symptoms and no complaint of pain. In quite a number of cases hyperæsthesia appears before the paralysis. It is difficult to elicit a reliable history of the sequence of symptoms in young children. We are better able to obtain information from young adults; some of them have noted a numbness preceding the loss of power, while others have complained of a burning sensation in the extremities and sometimes of shooting pains. In one case following a febrile attack, the right leg was affected and, four months later, the quadriceps of the opposite leg. Such late developments, however, must be very rare.

We are accustomed to look upon the first stage as extending from the onset until all pain has disappeared. If there is no pain, or very transient pain, it is wiser to consider the first or acute stage as lasting six weeks, but so long as pain lasts we must look upon it as indicating active irritation of the cord. I have known the stage of pain to last for nine weeks; in that case, although the paralysis was extensive, it was of a very transient character. Lovett tells us that in America it has proved very necessary that the surgeon should be possessed of the evidence upon which a diagnosis of poliomyelitis has been made. They found it imperative to have recourse to lumbar puncture, because many abortive cases occurred which were potential dangers to the family and State; only in this way could the isolation of the abortive case be secured. It had the further advantage of securing rest in the pre-paralytic stage, and of arousing suspicion whenever a transient weakness was discovered in a muscle or muscle group. We must bear in mind that while lumbar puncture is valuable for diagnostic purposes, it is also a mode of treatment which has proved of benefit in the acute stages of the affection.

The second period usually lasts for two years, and corresponds to the absorptive changes in the cord. During part of this stage the motor area is frustrated in its efforts to send impulses to muscles; in time, however, some of the paths recover and muscular power returns. Even while the power returns, trophic disturbances begin, affecting both circulation and growth, and it is in this period that deformities appear, unless appropriate measures are adopted. The surgeon, unfortunately, too often comes upon the scene only in time to correct conditions which should not have arisen, and when preventive measures are too late. The reflex arc being broken, the reflexes in the affected area are diminished or lost. The electrical examination of the paralysed muscles is only of value when the tests are carried out by an expert. If the muscle retains its faradic excitability when tested a few days after the onset of the disease, a good prognosis may be given. If, on the other hand, the

muscle has lost its faradic excitability, and the response to interrupted galvanic stimulation is slow (the reaction of degeneration), this is evidence of interruption of the lower motor neuron, and the prognosis is correspondingly more grave. From the electrical examination at this stage no accurate prognosis can be given as to the ultimate fate of the affected muscles. The difficulties of diagnosis during the stage of onset are sometimes complicated by pre-existing conditions, such as shortening from fracture, congenital dislocation of the hip, infantile hemiplegia, and in one very interesting case I remember the spasmodic conditions of the limbs due to spastic paraplegia were considerably modified by a superimposed poliomyelitis.

In the early stages of treatment it is usually impossible to state the degree of shortening which will ultimately persist. It is very rare to find a shortening of more than 3 in. The shortening is not definitely proportionate to the degree of residual paralysis, but bears a closer relation to trophic changes. In one case there was complete paralysis of the right leg and a mere paresis of the left quadriceps, yet the left leg was an inch shorter than the right. In another instance a paralysis confined to the calf muscles resulted in a limb with two and a half inches of shortening. It is equally difficult to foretell the degree of recovery of function. Although it is unusual, I have seen cases in which a muscle has only begun to improve after three years of complete paralysis. When the stage of onset and tenderness is protracted, recovery of the muscles is usually postponed, but the improvement continues for a longer period. Lovett has pointed out, and I can confirm it from my own observation, that cases which present a fairly complete paralysis below a definite level are unfavourable, and that cases which have a considerable amount of total paralysis persisting after three months will only make a very partial recovery. There are, however, notable exceptions.

TREATMENT.

Intimately connected with the question of prognosis is that of treatment, which very largely influences it. From the onset to the end of the second stage, and even later, we have to avoid meddlesome methods, and to recognize that muscles we are apt to look upon as paralysed may after all be merely weak. I pointed out, many years ago, that a muscle exhibiting the reaction of degeneration is not necessarily outside the pale of hope, and that while we may be certain that if a muscle reacts to faradism it will recover the converse does not always hold. Prognosis is more hopeful if from the first we visualize the obstacles to recovery and avoid them.

Rest.

The early treatment of poliomyelitis is usually the responsibility of the general practitioner who has to direct the case on correct principles. During the stage of onset we must trust entirely to rest, and even then protect the muscles which are weak and obstruct the coming of deformity. The head and spinal column should be kept absolutely at rest in obedience to the general law as applied to inflamed structures. Rigid fixation of the head and spine is a relief to pain, but if the pain is slight rest is imperative, for physiological reasons. The appliance should be cosy and so constructed that nursing is rendered harmless, and nothing should be allowed to take place which might conceivably frighten the child. Body and mind should be kept at rest. While active mischief is present in the cord, electricity and massage should be avoided.

It is not physiological to irritate and stimulate peripheral ends of nerves connected with inflamed centres. The practice is irrational, cruel, and reactionary. Applications of heat and cold are equally to be condemned. We are dealing with a damaged cord, which must be zealously guarded from fussy therapy. Deformity must be prevented at this stage as well as at every other, and this can be done without any irritation to the child. We must remember that deformity involves a loss of power both in the contracted and in the overstretched muscle groups. The deformities which we usually have to guard against are: contraction of the feet in plantar flexion, flexion of the hips and knees, adduction of the shoulder, and curvatures of the spine. If the child is on a frame soft pillows can be used to correct other deformities; but again I would repeat that nothing is to be done in any way likely to worry the child. Crying is one of the worst evils to inflict upon a tender head and spine.

Before approaching the second phase of treatment I must beg of you, as I have so often done before, to remember that a muscle which is submitted to stretching will lose its function, and that we must draw a distinction between a muscle paralysed by destruction of its governing cell and a muscle disabled and impotent from overstretching. This was pointed out by Thomas forty years ago. It is the fundamental element in our treatment of the disabled muscle. In poliomyelitis the factors that are at work in abnormally elongating muscles are: unopposed muscular action; the influence of gravity, as in plantar flexion of the ankle; deflection of body weight in walking, such as occurs in the foot when, in paralysis of the tibial group, the patient walks on his inner ankle.

Examples and proofs have on several occasions been supplied in abundance, but, although there is a general agreement with the theory, practice leaves much to be desired. If by stretching a normal muscle for a lengthened period we deprive it of power, how important it becomes that a partially paralysed muscle, struggling for function, should receive a helping hand! It cannot be too strongly stated that a paralysed muscle should be kept relaxed, without a solitary break in continuity, until recovery occurs. This should be done at once, for when the deformities become fixed the contracted muscles become structurally shortened and, in accordance with a well-recognized physiological law, all the tissues on the contracted side participate in the change. From this it follows that, in paralysis of the deltoid, the arm should be kept abducted; in paralysis of the flexors of the arm the elbow should be kept flexed and pronated; when the foot has lost the power of dorsiflexion, it should be maintained in dorsiflexion—and so, in all deformities, the functioning muscles should be stretched and the weak ones relaxed.

The next principle I would emphasize is that as recovery begins to take place the relaxation must be lessened by small degrees, the extent being regulated by the patient's ability to make use of the muscle in the extended range. There is yet another important fact—namely, that if a muscle is over-exercised it will begin to lose power. I have met with many instances where a recovering muscle has lost all its power when it has been given its liberty too soon. We must therefore be careful not to overtax a weak muscle. Cases are continually occurring where recovery ceases in a muscle asked to do more work than it is physiologically capable of doing.

In this second stage we are constantly called upon to correct deformity which, as we know, if left may deprive the lengthened muscle of all hope of recovery; but we must also remember that the shortened muscle is also

weakened, because its range of movement is necessarily confined to a limited radius. I will not enter into details of the methods employed to correct deformity; it is enough to say that it can be done by a splint and bandage, and that in the lower extremities we secure the assistance of gravity. Excepting in extreme instances the knife is never needed. The correction is called for in the case of the lower extremities, in order to enable the patient to stand and walk with or without assistance, and to attain this end without the production of secondary deformities. In the case of the upper extremity, deformities are corrected mainly in order to obtain function.

Massage.

As soon as the patient is made straight, we devote our attention to the development of his muscles. This is a long and arduous task and too often becomes a routine. "Give the child massage" is often the prescription, as though it were a dose of castor oil. Our aim is to develop the weak muscles and not the strong ones, and yet massage and exercise as usually practised bring into play most prominently the muscles which we should desire to neglect. It is the duty of a physician or surgeon to instruct the masseuse as to her line of conduct, and to explain to her what is needed, and why. We then obtain intelligent co-operation. We shall then know that the muscles will not be fatigued, and that while they are massaged they remain in a position of relaxation and that all the movements are of a kind not calculated to strain the weak group. If the extensors of the wrist are weak, the wrist-joint will be kept dorsiflexed and not once allowed to move in the direction of plantar flexion. If the dorsiflexors of the foot are under treatment, the foot should never be plantar-flexed below the right angle; and both in the wrist and foot the fingers and toes should be actively exercised before an attempt is made to move the heavy joints.

Colin Mackenzie, in his suggestive work on the action of muscles, emphasizes the necessity of minimizing strain on weakened muscles during their re-education. A man suffering from a recovering deltoid, who cannot elevate his arm beyond a right angle when he stands erect, and is opposed by gravity, can complete the range of movement if he lies on a flat table covered with chalk in order to avoid friction; and so with the other groups. By this means very early voluntary effort becomes effective. The splints during this period should be so designed that no pressure on muscle can take place, and, where possible, massage should be practised without their removal.

Muscle Re-education.

Muscle training is of extreme value. It is based on the principle of concentrating the patient's attention so that brain cell and muscle will work in accord. Everything should be eliminated which interferes with the untrammelled action of the paralysed muscle, and when the slightest response follows an effort the enthusiastic expert will almost supply the patient with energy to persevere.

We can perhaps best illustrate this in the case of a limb with paralysis of the quadriceps. Very slight voluntary movement should be started early, but that movement should not be allowed to act on the joint, for the muscle is not strong enough to act against any such resistance. The knee, therefore, is kept fixed in full extension in order to rest the quadriceps. The first sign of recovery will be watched for, and the moment a voluntary twitch is observed

education is to be commenced. The masseuse teaches the patient to practise drawing up the patella. When this can be done, the patient is told to put a finger against the upper border of the patella and to give a little resistance to the action of the muscle. To allow the child to flex the knee at this stage would be to invite calamity. When the muscle has gained considerable strength the rigid splint may be changed for one that allows only a few degrees of flexion, and as soon as the patient has muscular control of the knee within that radius the range of flexion can be increased by degrees. The massage should be gentle in these early stages, for considerable damage is done if it is rough. All we can expect from it is an improvement in the nutrition of muscle. I could give scores of instances where recovering muscles have been weakened by fatigue from immoderate exercise and from energetic massage. Recovery from this is brought about by rest. My experience coincides with that of Lovett, who has drawn attention to the dangers of over-exercising a weak but recovering muscle. He instances the gastrocnemius muscle; "a normal gastrocnemius should be able to raise twice the body weight; if it is reduced to one quarter of its normal strength by a paralysis it is easy to see that walking is a continued over-use of this muscle. Nowhere have I seen the effects of over-fatigue more clearly exemplified than in the observation of this muscle. If the muscle is protected, much walking prevented, and a very high heel put on to throw it out of action, as a rule it is amenable to treatment, and I have seen instances where in a year or so the muscle returned to its full normal strength; but I have never seen a case of any considerable weakening of the gastrocnemius muscle do otherwise than badly when walking was allowed freely and the leg not protected by a high heel." This is all borne out by examples we commonly see where paralytics who are undergoing intensive treatment make no progress until they are laid up by some other affection, and the muscles instead of deteriorating gain considerable power. Experience justifies us in concluding that exercise without weight-bearing should be continued until the muscles have gained considerable strength, and that when the time for walking comes it should be regulated with scientific precision.

Electrical Stimulation.

I have spoken of rest, massage, and muscle re-education, and these are the means which appeal to me as of the greatest value; but electrical stimulation is a legitimate and useful means of giving certain muscles a mild and beneficial exercise, and the object of the treatment is to make the muscles contract. It is harmful as well as useless to immerse the affected limb in a bath and allow the current to pass through the water. If any action results it will be contraction of the normal muscles and stretching of the paralysed ones.

During the convalescent stage, until there is recovery of faradic excitability, interrupted galvanic stimulation is employed. It should be possible in a majority of cases for a specially trained masseuse, loyal to instructions, to stimulate the paralysed muscle to contract without the spread of the stimulus to the normal muscles. Faradic stimulation is of service only with recovering muscles which will again react to this form of stimulus, or for those muscles weakened but not paralysed. Fatigue must not be brought on; the electrically provoked exercise must stop short of this. It should be painless, or practically so, and not cause terror to the child. If it does it should be discontinued. For obvious reasons a paralysed limb should always be kept warm.

Correction of Deformities.

As the object of treatment is to secure the highest possible degree of function we must prevent or obliterate all deformities. Deformities are primarily due to the contraction of muscles; other preventable factors assist. Although they can be rectified at any stage their persistence through the early months will have inflicted very serious damage upon the weak muscle groups. I have seen marked contractions of the hips in five weeks after the onset; and of all deformities, if allowed to become fixed, they are the most difficult to deal with—if we exclude scoliosis—and are a prolific cause of secondary deformities. They occur with greatest certainty where the glutei are weak and the flexors retain some power. They are favoured by sitting and crawling, and are best treated by the use of a double frame, so that the stretching may be continuous. Treatment by posture, such as lying on the face, is less effective, as it is intermittent and violates the fundamental principle we have enunciated in regard to the stretching of muscles. The same criticism applies to scoliosis. There is no position like the recumbent until the maximum of recovery is assured.

Shoulder contractions are also obstinate, and are due to paralysis of the deltoid and overaction of the pectoralis major and latissimus dorsi; the arm should be abducted from the first, and if adduction has occurred the deformity may be corrected by stretching and an abduction splint applied, as advised by Colin Mackenzie. A paralytic child, unprotected, sitting or lying in a heap, is a pathetic instance of surgical ignorance or neglect. Deformities should be rectified, when possible, by mild and persuasive means, but no excuse can be accepted in these days either for their occurrence or for their continued existence. Much can be learnt from the gait of paralytics, so well described by Lovett. When the gluteus maximus is paralysed we find that when weight is borne on the affected side the body is thrown back with a sudden lurch and the patient hurries with the other leg. The gait is like that of a patient wearing an artificial leg after an amputation of the upper third of the thigh. Paralysis of the adductors does not cause much limp, but it can be detected by asking the patient to put one foot directly in front of the other. With weak adductors this can only be done by swinging the body.

If the hip flexors are involved the patient brings the affected limb in front by a forward twist of that side. In paralysis of the quadriceps one of several methods may be adopted. He may keep the knee from flexing as he walks by pressing the thigh back with one hand, or as the affected limb touches the ground the patient hyperextends the knee to lock the joint; both these practices produce genu recurvatum. Again, he may walk with his leg rotated outwards to avoid the action of gravity; if he has strong hamstrings he can lock the knee without fully extending, simply by bending the whole body forwards.

The gluteus medius, an antagonist to the adductors, draws the thigh outwards when the pelvis is fixed, or abducts the trunk when the thigh is fixed. Its paralysis causes a characteristic gait. When the patient bears weight in walking on the affected side he lurches over to that side in an attempt to balance, and the lameness is often indistinguishable from that caused by marked shortening of the leg. Lovett has shown us that the limp is largely obliterated during the examination by giving the patient a weight of 5 to 15 lb. to carry in the hand of the affected side. It changes the centre of gravity and compensates for the weakness of the muscle.

With weak abdominal muscles the patient stands and walks sway-backed with the hip flexed, marked lumbar lordosis, and prominent abdomen. Unilateral paralysis of the abdominal muscles causes the patient to drop the pelvis on the weak side in taking the weight on the good leg. It is similar to the position taken by a patient with congenital dislocation of the hip when standing on the affected leg. I need not describe other gaits, but it will be seen that by observing the patient's walk the more characteristic paralyses may be noted.

In the third or chronic stage, when all the recovery we can expect has occurred, the surgeon's task is one of restoring his patient to usefulness. The correction of deformity is absolutely essential, for no muscle can be restored unless this is done, and from the mechanical side it is impossible to walk with joints flexed or hyperextended. Of the methods by which we correct various deformities I need only say they are simple. That our present methods will be improved is a commonplace, but there is no reason even now why paralysis should be followed by deformity, except scoliosis, and there is no reason why, if deformity has been allowed to appear, it should not be corrected by one of many means at our disposal.

Splints are used for three objects—the prevention of deformity, the correction of deformity, and to assist the function of the upper arm or locomotion in the lower limb. They should be simple in design and made of light material only, just sufficiently strong to effect their task. They must be looked upon as the lesser evils, and when they can be safely discarded they should be. In the lower limb apparatus is indicated if the patient cannot walk so well without such aid, or if he can only walk or stand in a position of deformity. When a splint is applied, we must carefully note whether its use prevents or induces secondary deformities. But granted that apparatus in itself is undesirable, the conditions to prevent which it is put on are still more undesirable. These are inability to walk, the acquirement of malposition and permanent deformity, and the stretching of paralysed muscles. We must remember that deformity starts as a postural malposition, becomes fixed by adaptive changes in the soft parts, and progresses to permanent bony deformity in accordance with Wolff's law. These deformities are of every type—dislocation of the femur, knock-knee, genu recurvatum, flexed joints, subluxation of the tibia, contracted and dropping of the shoulder, and scoliosis.

When we come to a general consideration of operations we find they are of two types: one to stabilize a flail joint by operation on the skeleton, the other to restore muscular balance. Our views on the value of arthrodesis have been modified of late years as the result of the introduction of other methods. In the knee-joint it is never necessary in children, and but very rarely in adults. The inconvenience of a stiff knee is a serious one, and the problem is better dealt with by the application of a splint which will permit of flexion. The same may be said of the hip. Arthrodesis of the ankle yields at best an imperfect functional result, and although perhaps at times desirable in adults, it is contra-indicated in young children, and less desirable in older children, than other methods at our command. Arthrodesis of the astragalo-calcaneum joint, so performed as to correct any lateral deviation in the feet, is proving of increasing value, for excessive lateral mobility without stability is difficult of control by mechanical means. Arthrodesis of the shoulder is of considerable advantage when the deltoid is irrecoverable and the function of the rest of the arm is good. Before it is performed the muscles of the shoulder girdle must be working, as the object of the operation is to fix the head of the humerus into the glenoid at an appropriate angle so that the arm may be moved by the

scapular muscles. In children over 10 years the scapular movements become very free with increasing growth, and after an arthrodesis the arm can be placed to the back of the neck, or into the trouser pocket. This operation should be but rarely performed in the adult, and its limitations should always be fully described to the patient.

In a technically successful operation in an adult the patient was dissatisfied with the result because previously she could do her hair and fasten the back of her dress by placing the paralysed arm in position with the other, whereas after the arthrodesis the inability to mobilize the scapula sufficiently in adult life prevented the extremes of motion required in these two movements. As a preliminary to arthrodesis of the shoulder intensive exercises for the scapular muscles are needed, and unless the patient can shrug the shoulder with considerable power arthrodesis is contra-indicated.

If an arthrodesis is performed on the adult the arm should be fixed in abduction at a lesser angle than in the case of a child. In the child the scapular movement can be considerably increased over the normal range during the years of growth. In the adult there is a danger, if the abduction is extreme, that the arm cannot be brought to the side. This is a very serious functional result.

Tendon transplantation is beginning to appear in its true perspective, and the complicated operations in vogue some years back are no longer performed. Its object is to improve or to restore muscular balance, and it is to be condemned unless it is performed with a reasonable chance of improving function. The transplanted muscle should become a true substitute for the muscle which is paralysed. It may be performed in order to prevent or correct deformity, and the recent tendency of surgical practice is to employ it in conjunction with operations designed to improve stability. Its task in that case is not so responsible as when the transplanted tendon is called upon to do the whole of the work itself. Tendon transplantation is a procedure which calls for sound judgment and irreproachable technique.

Every case represents a separate anatomical problem, and it is not indicated unless there are normal tendons to transplant. The question of operation does not arise when the muscles are all partially paralysed. If nothing has been done in order to relieve the paralysed muscles from tension an operation is not justified until relaxation has been tried, and it is fundamental that all deformity should be fully corrected before a transplantation is done. Naughton Dunn of Birmingham has lately made a distinct advance in the treatment of paralysed feet which require apparatus, by shortening and stabilizing the foot. The operation consists of arthrodesis of the astragalo-calcanean joint and the removal of various portions of bone from the tarsus, retaining the function of the ankle-joint and fortifying plantar flexion by transplantation of the muscles which pass to the sole into the tendo Achillis. I examined some fifty patients upon whom this operation had been performed, and the results were excellent, most of the patients walking without apparatus.

Associated with the success of tendon transplantation is the recognition of those principles which bear upon the relaxation of muscle and fatigue. Any attempt to overwork a transplanted tendon results in weakening it, and until it gains strength it should be treated as if it were partially paralysed. Massage and re-education should be conducted in the absence of weight-bearing.

With improved technique the operation of tendon fixation has gained in surgical esteem, and has made much headway since Tilanus introduced it, much of the improvement being based on the experimental work of Gallie. It

consists in the utilization of paralysed tendons as ligaments. The success depends largely upon the anchorage being made very near the articular ends of bone on both sides of the joint, so that a very short piece of tendon is under strain. For instance, in paralytic foot-drop, the tendon of the paralysed calf muscles is divided, and the lower end split longitudinally, one half being brought through the tibia and the other through the fibula, with the foot kept at a right angle. In this way we form a very firm ligament, which prevents dorsiflexion of the foot. These fixation operations have supplanted the employment of silk ligaments, but the practical point wants emphasizing—that it is essential that the tendons should be fixed just above and below the joint, in order to minimize the danger of stretching. More recently free fascial transplants have been used to form ligaments, but our experience is not sufficient to allow of a considered judgment in this matter.

The tendency of modern surgery is to stabilize the ankle, and the surgeon calls to his aid a variety of methods. If he deals with a calcaneo-cavus where only the flexors of the toes are working, and perhaps the peronei, he first performs arthrodesis of the calcaneo-astragaloid joint to give lateral stability, and then of the front of the foot, shortening it at the same time. He does not touch the ankle-joint. The peronei and flexors of the toes are passed through the back of the os calcis. If the muscles are weak and will not bear the full strain of body weight, the lower portion of the impotent tendo Achillis is transformed into a strong ligament. In short, he employs arthrodesis to shorten the foot so that leverage is rendered less harmful, and to prevent lateral instability; he employs tendon transplantation to supplant a paralysed calf muscle, and he limits the movement of the ankle by a tendon fixation in order that the transplanted tendons may be saved from fatigue. This is excellent team work, in which all the structures of the foot participate. For pronounced knock-knee, so often found in neglected paralysis, subcutaneous osteotomy is sufficient.

The deformity produced by shortening can now be overcome by an operation devised to lengthen the femur, just in the same way as we lengthen a tendon. If the shortening is the result of a paralytic dislocation the displacement can be reduced and the capsule plicated. In fact, there is no deformity to be met with that should baffle surgical art. Operations, however, are but *incidents* in the treatment of paralysis, and it is upon recognition of sound principles in the after-care that we depend for the restoration of function.

Nerve transplantation, which at one time seemed so reasonable, is no longer practised, and our observations during the war upon nerve transplantation in paralysis of the peripheral nerves confirm us in discouraging it in infantile paralysis. The direct neurotization of paralysed muscle is only in its experimental stage, and the result will be followed with great interest and considerable misgiving.

My apology for bringing before so learned an audience these elementary but practical principles is that I fear that, even in high places, men are content to pay them a mere academic homage.

Case of Purpura Fulminans following Measles.

By E. H. KELLY, M.B.

(Introduced by J. D. ROLLESTON, M.D.)

[The case will be published in full in the *British Journal of Children's Diseases*, April-June, 1922.]

THE patient was a boy aged 17 months, admitted to the Grove Fever Hospital, certified as a case of measles, broncho-pneumonia and cancrum oris. He showed a fading macular erythema on the trunk and limbs, conjunctivitis and coryza, and marked induration and swelling of the upper lip, the swelling extending into the inner half of the left cheek. Both lips showed fissuring with impetiginous crusting. The buccal mucous membrane and fauces were injected but clean. The temperature was 102° F., pulse 124 and respirations 56. The lungs showed moist râles at both bases with scattered rhonchi over both lungs.

Thirty c.c. of polyvalent antistreptococcal serum were injected into the abdomen. The child's condition improved daily. On the eleventh day after admission he developed his serum rash, a blotchy erythema on trunk and limbs. This faded the following day. On the fifteenth day his temperature rose to 103° F., the pulse was 150, respirations 50. He vomited several times during that day and complained of abdominal pain. His temperature was 102° F. on the following day, and his general condition somewhat improved. There was no further vomiting. The following morning (seventeenth day after admission) small petechiæ were seen on the trunk and limbs and a symmetrical purpuric area shaped like a butterfly's wings developed in the cheeks and nose. The child died in the afternoon of that day, fourteen hours after the first appearance of the purpura.

The blood was not examined and permission was not given for a post-mortem examination.

The family history and the child's previous history were not of interest.

DISCUSSION.

Dr. J. D. ROLLESTON said he did not doubt that this was a case of purpura fulminans. It fulfilled two of the three conditions laid down by Henoch in 1887; it had a fulminating course, the patient dying within eighteen hours of the first appearance of the purpura, and there were no hæmorrhages from the mucous membranes. Henoch's third condition could not be confirmed in this case, namely, the absence of hæmorrhages after death. Barely sixty cases of this condition had been recorded, and in a large proportion of them scarlet fever was the precursor. During twenty years he had seen about five such cases following scarlet fever; one case he saw followed diphtheria¹ in which the distribution of the purpura was the same as in the present patient. Purpura might follow the injection of ordinary diphtheria antitoxin, but he thought the use of the serum in this case might be eliminated in considering causes of death. Cases of purpura fulminans were recorded before the days of serum, and a large proportion of more recent cases had followed scarlet fever for which no serum had been given. Elliot,² in his monograph, mentioned two cases following measles.

¹ Gunson, E. B., *Proceedings*, 1915, viii (Child. Sect.), pp. 55-57.

² *Arch. Int. Med.*, 1909, iii, p. 193.

Dr. BELLINGHAM SMITH considered the use of the serum a very important factor in the fatal termination. The child seemed to have been fairly well until the normal time for a serum eruption to occur, and on the fifteenth day it developed acute purpura and died. He had seen two cases of purpura fulminans, and he agreed that the present case was correctly so described. In those two, a post-mortem examination showed the typical suprarenal hæmorrhage, in fact both suprarenals were a mass of blood-clot. He thought the present child had had a severe illness, and was presented with a large dose of antistreptococic serum, and died as a result of the very severe serum reaction.

Dr. F. PARKES WEBER thought the question of acute fatal purpura was intimately associated with that of acute bacterial infections. Cases had been recorded of meningococcal or other microbial septicæmia which had ended fatally under the clinical picture of pupura. He thought the ætiology of these cases could not possibly be cleared up without a careful bacteriological examination of the blood during life; in the absence of such in this case he would not like to suggest that the serum injection had played any causal part. Was the usual cause of death in these cases of fatal purpura (especially in children) actually acute hæmorrhage into both suprarenal glands?

Case of Friedreich's Ataxia associated with Coloboma of Iris and Choroid.

By D. McALPINE, M.B.

BOY, aged 5 years 11 months, admitted to Maida Vale Hospital, March, 1922, under Dr. Anthony Feiling, to whom I am indebted for permission to show the case.

History: His mother states child appeared normal at birth and up to age of 2 years. She then noticed that he was backward in walking and seemed unsteady on his legs. He has made very little improvement in this respect since then. No illness except a fit about the age of 2 years and two others have occurred at intervals since then.

Family history: Patient youngest of four; others healthy; no miscarriages.

Present condition: Undersized child. Height, 3 ft. 4½ in.; weight, 2 st. 10 lb. Seems moderately intelligent. Eyes: Coloboma of iris passing downwards and inwards; large coloboma of choroid involving optic nerve entrance; vision seems full; lateral nystagmus. Arms: Moderate hypotonia, power fair; reflexes sluggish; sensation normal; slight ataxia. Abdomen: Reflexes active. Vertebral column: Normal. Legs: Slight hypotonia; musculature flabby, but no appreciable atrophy; power fair; double pes cavus and right talipes equino-varus; knee-jerks extremely sluggish; ankle-jerks absent; plantar response, right—extensor, left—indefinite; marked ataxia; sensation normal. Gait: Walks unsteadily with broad base in waddling fashion; arms abducted at shoulder and flexed at elbows, and are used to balance himself. Sphincters: Normal. Other systems normal. Wassermann: Blood and cerebro-spinal fluid negative.

Familial Cerebral Degeneration.

By DONALD PATERSON, M.D.

I HAVE called this case one of familial cerebral degeneration. The child is aged 6 months and was seen at the out-patient department at the Children's Hospital, Great Ormond Street on April 18, 1922. He was brought up

because he took no notice of his surroundings, and because he seemed to be "going backward." This had been observed for the previous two months.

The family history showed a healthy mother and father with no history of a similar complaint on either side. The parents were not Jews. There had been eleven pregnancies, no miscarriages. Three children, including the patient, are alive, a boy of 12 years and a girl of 4 years, both healthy. Of the eight who are dead, one died of prematurity, the other seven suffered in a similar manner to the patient. Up to the age of 3 to 4 months they were apparently healthy, when they became weak and apathetic. The neck muscles were weak and the children failed to take notice of their surroundings, although they seemed able to hear. There is no record of an examination of the eyes, but the mother was told on previous occasions that her children were probably suffering from amaurotic family idiocy. Gradually these children wasted, but did not in any way become spastic. With the exception of one child who lived to the age of 2 years and 1 month, all the others died at from 6 to 8 months old.

The patient seemed healthy at birth, but after 3 to 4 months he was seen to be developing the same symptoms as the other children, and now at the age of 6 months, he cannot see, he seems to hear, his reflexes are normal, he is not spastic, he seldom cries and appears to show gross mental impairment. The discs have been repeatedly examined and are normal, and the Wassermann reaction is negative. The eyes show a slight external squint. No paralysis of the respiratory muscles or of the muscles of the limbs is to be noted. He has well marked rachitic bone changes and this diagnosis is borne out by the X-rays.

Of the two forms of familial cerebral degeneration described, this resembles that of Tay-Sachs' disease, or amaurotic family idiocy. The age of onset is identical, the early symptoms are the same, but there are no changes in the fundus which are so characteristic of Tay-Sachs' disease, the parents are not Jews, there are no spastic changes, and finally the course of the disease is much shorter, amaurotic family idiocy seldom terminating under one year.

The other form of family cerebral degeneration described with symmetrical changes in the macula commences at the age of about 6 years. The child becomes dull and dirty in its habits, and rapid mental degeneration follows, with associated pigmentation of the macula.

The difficulty in the diagnosis seems to be whether or not we are dealing with a case of amaurotic family idiocy in which the macular and other changes come on late and the child dies before they are fully established.

Postscript.—This child died and a post-mortem examination was performed on May 1. No gross changes were found and sections are being made for microscopical examination.

Case of Congenital Morbus Cordis associated with Coloboma of Iris and Choroid.

By D. McALPINE, M.B.

GIRL, aged 11 years, attended Belgrave Hospital for Children in January, 1922, complaining of pains in her limbs. In the spring of 1921 she was ill in bed with rheumatism affecting her joints. Since then she has been subject to pains.

Family history: Patient one of twelve: one child died of heart disease, aged 2 years; others healthy.

Present condition: Pale girl; no cyanosis; no clubbing of fingers. Coloboma of iris and large coloboma of choroid involving optic nerve entrance. Heart: Apex beat diffuse $\frac{1}{2}$ in. external to nipple line in fifth space; no enlargement to right; loud somewhat rough systolic murmur at pulmonary area; second sound well intoned, short systolic murmur at apex, not conducted outwards. Red corpuscles, 4,500,000. Wassermann negative.

Remarks: Position of apex beat indicates presence of rheumatic myocarditis in addition to patent ductus arteriosus.

Section for the Study of Disease in Children.

President—Sir ROBERT JONES, K.B.E., C.B., F.R.C.S.Ed.

Right-sided Hemihypotrophy from Congenital Spastic Hemiplegia, with changes on the Left Side of the Brain shown by Röntgen Skiagrams.

By F. PARKES WEBER, M.D.

[The case is described in full (with illustrations) in the *Journal of Neurology and Psychopathology*, 1922, iii, pp. 134-139.]

Case of Imbecility due to Congenital Hydrocephalus.

By W. M. FELDMAN, M.D.

A. I., GIRL, aged 6 years. First child, full term. No previous or subsequent miscarriages or abortion, and no other evidence of syphilis (no Wassermann test made of the blood of the parents, but there is good reason for the exclusion of a luetic taint). Breast-fed till the age of 5 months.

Family history: No consanguinity of parents and no history of nervous or mental trouble in ascendants or collaterals of either parent except that father has been a slight stammerer ever since the age of 5 years, and a brother of the patient, 5 years old, cannot yet talk though normal in all other respects.

Obstetric history: Vertex presentation. No forceps. Head was noticed to be very soft from birth, with large separations between the bones. These separations disappeared at 14 months of age with the exception of the anterior fontanelle which closed at 2 years. Frequent convulsions from 6 months to 2 years.

Present condition: Mental and physical development very backward since birth. Could not sit up till the age of $2\frac{1}{2}$ years. Walked at 4 years. Her legs are still weak except when she has a course of thyroid, which considerably strengthens them; she understands, but cannot talk; very obstinate and cross. Circumference of head, $19\frac{3}{4}$ in. No congenital deformities.

Although there seems to be no cretinoid element in it, as the skin is soft and supple, and the hair good, still, as soon as thyroid treatment is stopped her condition definitely gets worse, and she cannot walk as well as when she is taking it. I shall be glad to know whether pituitary extract is likely to do her good. So far, I have tried only thyroid.

Dr. F. PARKES WEBER said it was necessary to remember that thyroid gland substance might exert an effect in a non-specific way—namely, by increasing the metabolism; that might explain the improvement which had been noted. Children's moral defects might, perhaps, in some cases, be accentuated by taking thyroid.

Case of ? Tumour of Suprarenal Cortex.

By H. CHODAK GREGORY, M.D.

MALE, aged 2½ years. Weight, 2 st. 9 lb. Always a fine child, but parents began to be anxious during the last few months as he was putting on weight so rapidly. Breast-fed for nine months, then fed on cow's milk and boiled bread, afterwards on potatoes, with gravy, &c. Said to have about a pint of milk a day. Mother and father of normal size and stature; three other children normal.

On examination: A large plethoric-looking child with much fat and also exaggerated muscular development. The fat face rather disguises the fact that the head is much larger than normal for his age. Circumference, 22 in. No tumour can be felt in the abdomen. Urine normal. External genitals normally developed. Blood count: red blood corpuscles, 4,200,000. Wassermann reaction negative.

Mental condition precocious: he can whistle, and he amuses himself by imitating the nurses, and talks more like a child of 4 or 5 than of 2 years old.

His appetite is enormous. A day of concentrated carbohydrate feeding, with many sweets, has not resulted in producing glycosuria. Pituitary body (anterior lobe) has been administered, but without effect. A little, but hardly appreciable, weight was lost by cutting down the carbohydrate of the food.

The case has certain resemblances to Fröhlich's syndrome, especially as there appears to be a good sugar tolerance, though this point has not been accurately worked out. It rather more suggests, however, a cortical hypernephroma, the plethoric appearance, muscular development and mental precocity all being in favour of this diagnosis. The genital organs are well developed; this does not agree with Fröhlich's syndrome, but it can hardly be called a sign of precocity.

DISCUSSION.

Dr. PORTER PARKINSON said that this looked like the typical case described by the late Dr. Leonard Guthrie as "brewer's drayman type of suprarenal tumour." In Dr. Guthrie's cases the patients were all over 8 years of age.

Dr. W. M. FELDMAN agreed that as far as the facies of this case was concerned, it was typical of tumour of the suprarenal. It looked like the original of a picture in Sir John Bland-Sutton's book on "Tumours," illustrating tumour of the suprarenal cortex.

Dr. F. PARKES WEBER said this case might be one of tumour of the suprarenal cortical substance, but knowledge on the subject was very deficient. Although many cases had been diagnosed clinically, very few had been followed up, so that the nature of many cases had never been proved. An adenomatous or carcino-adenomatous suprarenal tumour need not be in the actual suprarenal gland; such tumours had been known to occur in the testis. It would be of great interest to know what was the brachial systolic blood-pressure in this case. In the recent uncertain case described by Dr. Bellingham Smith¹ the blood-pressure was very high. The blood-pressure might be a factor in causing sudden death in some of the cases (internal hæmorrhage in the cranial cavity or in the suprarenal glands).

Dr. HUGH THURSFIELD said that in the present instance he saw no reason for thinking that there was more than a functional disturbance of the endocrinal balance.

¹ See *Proceedings*, 1922, xv (Sect. Study Dis. Child.), pp. 25-30.

Two Cases of Congenital Hemihypertrophy.

By DONALD PATERSON, M.B., and F. NEON REYNOLDS, M.R.C.S.

THE following are good examples of a rare congenital abnormality :—

Case I.—Female infant, aged 6 months, seen at the out-patient department of the Children's Hospital, Great Ormond Street. She was an only child and had had no previous illnesses. The father and mother are healthy. The whole of the left side of the body had been noticed to be larger than the right side. The skull showed no definite asymmetry, the zygoma, ear and cheek were all enlarged on the left side. The left breast and thoracic muscles were better marked than on the right side.

The left arm and leg were distinctly enlarged and the leg measurements were as follows: Circumference of the thigh at the gluteal fold, left 12 in., right 10½ in.; circumference of the leg at the knee, left 9 in., right 7½ in.; anterior superior spine to internal malleolus, left 10¾ in., right 10¼ in. The X-rays show a definite thickening and hypertrophy of the bones of the leg, the left tibia being definitely thicker and longer than the right. Apart from this condition no other abnormalities were to be noted and the child seems in every way normal.

Case II.—O. M., girl, aged 13 years. This is a case of hemihypertrophy affecting part of the right side of the face. The parts chiefly affected are the malar bone and the superior maxilla, with the soft tissues covering them. The temporal bone and muscles are affected to a less extent, as are also the lower jaw and the masseter muscle. The measurements from the external occipital protuberance to the symphysis of the superior maxillæ are—right 11 in., left 10½ in.

The ear and eye are unaffected; the discs are normal. An interesting feature is the condition of the teeth: those in the upper jaw on the right side, especially the two back molars, are very much larger than any others in the mouth.

X-rays show a general enlargement of all the bones of the skull. The rest of the body is unaffected and the child appears quite normal mentally and physically. There is no history of trauma at birth; the labour was normal. There are five other children, none of whom show any abnormality; the patient is the youngest but one.

This condition of hemihypertrophy is a very interesting one, and as the whole question as to what really governs growth centres around it, it has always excited a great deal of controversy.

Various classifications have been given; there is false hypertrophy where the enlargement is due to an extensive nævoid or lipomatous growth of one side of the body or one portion of one side. In this type the soft parts only are affected and the bones do not show thickening nor is there lengthening of the limbs on the affected side. True hypertrophy however is the condition where all the structures are involved, including the subcutaneous tissue, muscle and bone. In this type the limbs show lengthening as well as an increase in their girth. X-rays show a true enlargement of the bones on the affected side.

Arnold Gesell has collected forty cases (reported up to 1921) of complete hemihypertrophy where all the structures on one side of the body were involved

52 Paterson and Reynolds: *Congenital Hemihypertrophy*

and thirty cases where the hypertrophy was partial, and in some cases was crossed so that an arm was involved on one side and a leg on the other side.

Gesell found that the hypertrophy was confined to the right side of the body in 70 per cent. of his cases and that it was slightly more common in males than in females. It is rare to see this condition in adults.

Along with this condition skin abnormalities such as naevi are sometimes found. Mental defect is also frequently associated with it.

Many theories have been advanced as to how this hypertrophy is brought about, but few of these have anything to substantiate them. Dr. Robert Hutchison's case, in which there was a very complete post-mortem examination, showed a hypertrophy of all the internal organs on the affected side especially of the suprarenal capsules. The side of the brain opposite to the hypertrophied side of the body has occasionally been found enlarged.

It has been pointed out that the affected side looks older than the unaffected side and that the carpus and teeth as seen by X-rays show hypertrophy and more advanced ossification on this side.

Some authors attribute this hypertrophy to the action of the endocrine glands and especially to the pituitary and the suprarenal. This is difficult to explain unless they act through the nerves and the changes are then really neurotrophic. Fortescue-Brickdale reported a case in 1915, giving reasons for considering the condition to be one of hypertrophy rather than of atrophy.

Our thanks are due to Dr. Kenneth Smith, of Camberwell, for allowing us to show Case I, and to Mr. Addison for Case II.

BIBLIOGRAPHY.

- ARCHIBALD, M. H., *Brit. Med. Journ.*, 1915, i, p. 595. BLACK-MILNE, J., *Brit. Journ. Child. Dis.*, 1920, xvii, p. 79. CARPENTER, GEORGE, *Brit. Journ. Child. Dis.*, 1906, iii, p. 63. EDWARD, W., *Lancet*, March 30, 1918, p. 463. ENGLAND, W. S., *Lancet*, 1902, ii, p. 1711. FORTESCUE-BRICKDALE, J. M., *Lancet*, 1915, ii, p. 10. GESELL, ARNOLD, *Arch. Neurol. and Phys. Psych.*, vi, No. 4, October, 1921, p. 400 (a most complete bibliography given in this article). GREGORY, H. H. C., *Proc. Roy. Soc. Med.*, 1920, xiii (Child. Sect.), p. 99. HALL, R. GEORGE, with comments by F. PARKES WEBER, *Brit. Journ. Child. Dis.*, 1921, xviii, p. 21. HIGGS, F. W., *Brit. Journ. Child. Dis.*, 1909, vi, p. 503. HUTCHISON, ROBERT, *Brit. Journ. Child. Dis.*, 1904, i, p. 259. *Idem*, *ibid.*, 1916, i, p. 113. LOCKHART-MUMMERY, P., *Proc. Roy. Soc. Med.*, 1907-08, i (Clin. Sect.), p. 61. SHAW, H. BATTY, *Proc. Roy. Soc. Med.*, 1915, viii (Child. Sect.), p. 15. STEWART, PURVES, "Diagnosis of Nervous Diseases," 4th ed., 1916, pp. 308-321.

Mr. A. T. PITTS said he had been asked to look at the dental condition in the second case. The first permanent molar was badly decayed, but it was a large tooth; however, the roots were separated, and the large size might be due to that. A skiagram of the teeth was necessary. The corresponding tooth on the opposite side was absent. The incisors, canines and pre-molars were not larger on the affected side than on the other. Mr. Hopson had shown, at the Section of Odontology,¹ a case in which there was a distinct difference in the size of the teeth on the two sides, which must go back to a period before birth, as the tooth germs were present before birth, and there was a marked increase in the alveolar process of the maxilla. In this case the upper teeth on the crowns were inclined outwards, but on the right side the crowns inclined inwards, this being due to the hypertrophy of the alveolar bone; the lower border of the mandible on that side appeared to be bent down, and the lower border on the right side was considerably lower than on the left. Another interesting feature was that there was a limitation of movement of the temporo-mandibular joint, due to the condition on the right side; the child could only open its mouth about half as widely as the normal child. He could not be sure from the skiagram whether there were bony changes.

¹ *Proc. Roy. Soc. Med.*, 1920, xiii (Sect. Odont.), p. 67.

Case for Diagnosis.

By B. WHITCHURCH HOWELL, F.R.C.S.

PATIENT, a boy, L. B., aged 8 years, has limped since he began to walk at the age of 2 years. He is the last of six children and was born when his mother was 46, there being an interval of twelve years between the fifth and sixth child. Normal labour. He has not grown at the same rate as the other children. No previous illness of note. The limp has been getting more pronounced lately, but there has never been any pain.

Right lower limb, relatively $\frac{1}{2}$ in. longer than left; talipes equino-cavovarus, slight, with contracted plantar fascia, tendo Achillis, and extensors with definite sustained extensor response (R); knee-jerks +; gait, slightly spastic, with straight knee, walking on balls of toes.

Intelligence, about the average: Wassermann reaction not yet obtained; X-rays (hips and pelvis) negative.

Opinions are asked as to the diagnosis and treatment.

Dr. F. PARKES WEBER said that in this case of progressive infantile spastic hemiplegia there seemed to be some progressive lesion which was interfering with the cerebral cortex at about the parietal region on the left side; it might possibly be of venous angiomatous nature. Such a case was recently operated upon by Sir Charles Ballance, and particulars were published by Dr. Harry Campbell and Sir Charles Ballance, in the *Lancet*, last January.¹ The nature of the lesion was thoroughly demonstrated at the operation.

Case of Dermato-Polyneuritis.

By HUGH THURSFIELD, M.D., and DONALD PATERSON, M.B.

THE patient, a female child aged 11 months, was admitted to the Children's Hospital, Great Ormond Street, May 23, 1922. She was the sixth child; the others were all alive and well. She was breast fed to the age of 7 months and was quite well up to that time. Then she began to be fed on a dried patent food. She had orange and grape juice at times. From the age of 9 months she has had new-laid eggs, bread and butter, chocolate and a piece of raw scraped apple at times. She had always had a good appetite and her bowels had been regular.

At the age of 7 months the child commenced teething and seven teeth came through at once. Since then she has been fretful and seems to be in pain. She has gradually become weaker, and has marked sweating of the whole body. Six weeks ago a rash appeared on the hands and feet, fading at the wrists. The hands and feet were red, puffy and peeling and extremely irritated, the child wanting to scratch them continually. The hair came out in patches. Insomnia was persistent and she looked the picture of misery.

On admission: The bones are well covered with flesh but the muscles are soft and flabby, and showed marked hypotonia of the joints. The child tends to lie with her mouth open like a young "nestling." She is extremely miserable and irritable and cries almost incessantly. Her hands and feet are red and

¹ Campbell and Ballance, "A Case of Venous Angioma of the Cerebral Cortex," *Lancet*, 1922, i, p. 10. Cf. also "A Case of Meningeal Nevus," by D. M. Greig, *Edin. Med. Journ.*, 1922, n.s., xxviii, p. 105. In both these cases there were also hemiplegic convulsive attacks.

there is desquamation on palms and soles. There is a slight puffiness of the hands and feet but no definite œdema. The face, which often is similarly affected, is normal at present. The ribs show slight beading. The glands are palpable in the left axilla. The heart, lungs and abdomen appear normal. The eyes appear normal and the knee-jerks are absent. There is no definite anæsthesia of the extremities. The child is not able to bear her weight on her limbs. The insomnia persists despite full doses of choral. She takes her food well. The temperature is now normal.

In a recent publication we put on record and gave the bibliography of what we believe to be the first case of this disease described in this country. In Australia the name erythrœdema is used. In America it has been described as acrodynia-pellagra. It is a peripheral neuritis with skin manifestation at the extremities, coming on between the ages of 6 months and 3 years, and ending usually in recovery.

BIBLIOGRAPHY.

THURSFIELD and PATERSON, *Brit. Journ. Child. Dis.*, 1922, xix, p. 27. F. PARKES WEBER, "Case of Erythrœdema," *ibid.*, 1922, xix, p. 17.

DISCUSSION.

Dr. THURSFIELD said that the tentative name given to this disease by his colleague and himself was "Dermato-Polyneuritis," and though they were not proud of it, it connoted more than either acrodynia or erythrœdema, as there was dermatitis of the extremities, and more or less of the face, and a neuritis, which expressed itself in a tonelessness of muscles, and definite sensory changes. These sensory changes were distinctly present in the other child. With regard to the ætiology of the disease, the Americans and Australians seemed at one time inclined to regard it as a deficiency disease, being possibly inspired by the recollection of pellagra in children, which was seen in the Southern States of America. Pellagra in the adult, at any rate, was very different to this condition; it seemed to be more acute in onset, and to go on to extreme pigmentation, while none of the cases of this condition seemed to have shown any pigmentation. The majority of these children seemed to have been uninfluenced by treatment with any known vitamins or in any other way. Most of them appeared to get well in a period varying between 6 and 18 months. In the most recently recorded case in America the patient was taken ill at 2½ years, life despaired of for many months, but at 4 years the state of health was normal. Therefore the process seemed to be a very slow one.

Dr. F. PARKES WEBER asked whether there were any nasal symptoms in this case. In some of the recent American cases there was reason to believe that a toxic effect was caused by some disease in the nose or sinuses. In one of the worst of Byfield's cases a nasal operation was performed. In Drs. Thursfield and Paterson's previous case there was a disagreeable nasal discharge. With regard to the nomenclature, some writers mentioned acrodynia and pellagra as if they were closely allied instead of totally different diseases; according to Byfield the present disease was certainly neither acrodynia nor pellagra. The name erythrœdema, used by Australian authors, could remain for the present; it meant simply a "red swelling," of hands and feet, and that was present in both Dr. Thursfield's English cases. Some Australian authors spoke of the "pink disease," a term which was open to objection, as it was not derived from the redness of hands and feet, but from a miliarial sweat rash, which in some cases had appeared on the trunk in an early stage.

Dr. W. J. ADIE said that the features of the case shown that day did not justify the "polyneuritis" part of the proposed name. Hypotonia of the limb muscles was common and the tendon reflexes were often difficult to obtain in sick children free from nervous disease. But Dr. Paterson had told him that in other cases definite peripheral anæsthesia of "glove and stocking" type had been found. This, with absence of the tendon reflexes, would warrant the name. Hypersensitiveness of the muscles to pressure would be a valuable confirmatory sign.

Section for the Study of Disease in Children.¹

President—Sir ROBERT JONES, K.B.E., C.B., F.R.C.S. Ed.

Cases of Mongolism and Cretinism.

By W. A. P. WATERS, M.D.

DR. WATERS showed several cases of Mongolism and Cretinism. In opening the discussion, he asked particularly as to the question of thyroid treatment for mongolism.

Drs. MURRAY-BLIGH, PRITCHARD, BELLINGHAM-SMITH and the CHAIRMAN (Dr. CAUTLEY), took part in the discussion. Although it was suggested that small doses of thyroid over a long period had a beneficial effect on mongols, the bulk of the opinion was to the effect that thyroid had no action whatever. There appeared to be some evidence that mongolism had become more common since the war; and several cases were quoted in which the typical ætiology of a late pregnancy in an elderly woman was notably absent.

Chronic Interstitial Keratitis, Atrophy and Spasticity of the Left Leg.

By A. G. GIBSON, M.D.

(Shown by Dr. W. T. COLLIER.)

PATIENT, a girl, aged 6 years.

Family history: One previous child, premature; died 7 years ago.

Previous history: In 1916 she attended the Oxford Eye Hospital, with discharge from the eyes. In January, 1921, she suffered from interstitial keratitis. The Wassermann reaction was + + + +. She was treated for six months on small doses of intravenous novarsenobillon and grey powder, and the grey powder has been continued since. In December, 1921, she had slight talipes equinovarus. The left foot and leg were cold. In May, 1922, the left leg was wasted below the knee, showing loss of power in the tibialis anticus and increase in tone of the quadriceps and calf muscles. There was no loss of sensation.

Present condition: Healed interstitial keratitis in the right eye. Wasting of the left leg below the hip with slight loss of power. Early talipes equinovarus in the left foot. Increase of all deep reflexes in the legs. No clonus obtained. Plantar response extensor on both sides. Sensation good. Left foot colder than the right. Gait, spastic, left leg. Cranial nerves, arms and trunk normal.

Diagnosis: Localized syphilitic myelitis of lumbar region of cord.

¹ Provincial Meeting at Oxford.

Case of Leucodermia.

By A. G. GIBSON, M.D.

(Shown by Dr. W. T. COLLIER.)

PATIENT, girl, aged 12 years. The condition of the skin began two years ago and the patient has suffered intermittently from morning headache and morning sickness, the sickness being sometimes present during the day; she occasionally faints, but consciousness is not completely lost and there are no epileptic symptoms; her appetite is poor and from time to time she is too ill to go to school.

Previous history: Patient was healthy when born; breast-fed. She suffered from inflammation of the lungs when 4 months old and has never been strong since. Measles in February, 1922.

Family history: Father and mother healthy. Two sisters are healthy. Two brothers, one of whom is delicate. One boy died from pneumonia when 14 months old. Patient is the youngest in the family. Mother's second pregnancy ended in a miscarriage.

Condition on admission: Thin; has a prominent chin; teeth in fair condition, but irregular; palate narrow; hands and nails good. Temporal veins obvious. The jugulars do not collapse in the upright position. Eustace Smith's retraction murmur is present. No glands felt anywhere. No disease detected in lungs. Abdomen tender and thickenings as of glands, which do not alter from day to day, can be felt. The central nervous system shows no abnormality. Wassermann reaction negative.

Case of Myelocytic Leukæmia.

By G. KERR CROSS, M.B.

GIRL, aged 12 years, suffering from myelocytic leukæmia with a typical blood-picture. Under X-ray treatment the spleen has diminished in size and the leucocytes have fallen from 225,000 to 35,000, with a corresponding improvement in health. Treatment commenced three years ago.

Case of Obesity of ? Suprarenal Origin.

By G. KERR CROSS, M.B.

GIRL, aged 14 years, healthy looking, extremely fat, weighing 15 st. 5 lb. No tumour of pituitary body seen by X-rays. Nothing abnormal found to account for her condition.

Case for Diagnosis.

By G. KERR CROSS, M.B.

GIRL, aged 14 months, fed on cow's milk and barley water, had been ill eight weeks with diarrhœa, vomiting and wasting. Slight bleeding from gums; intensely irritable; moist sounds all over chest. Small hæmorrhages over

abdominal wall, and on dorsum of feet. Hands and feet swollen and sometimes very blue and cold. Nose and cheeks livid. Wassermann negative. No family history of tubercle.

A tentative diagnosis of scurvy rickets had been made.

Dr. E. CAUTLEY (Chairman) said that scurvy rickets was a bad term and should not be used. This condition was a terminal phase in many acute diseases such as seasonal diarrhoea and vomiting or malnutrition. The prognosis was bad.

Case of "Permanent" Tracheotomy.

By G. KERR CROSS, M.B.

GIRL, aged 6 years. Admitted 3½ years ago with acute laryngeal diphtheria. Tracheotomy performed. During the following years many attempts were made to remove the tube but the patient refused to do without it. It was thought that suggestion might be tried. A lobster-tailed tube was used and for two weeks only the guard was tied round the neck. The patient did not notice the absence of the tube and when the guard was removed continued to breathe through her mouth. This was done in April last and the child has been at home since then and is now quite well.

DR. KERR CROSS also showed Cases of Bronchiectasis and Pseudo-hypertrophic Muscular Paralysis.

Six Cases of Intussusception after Operation.

By HUGH WHITELOCKE, M.B.

THE six cases are from a series of eleven operated on at the hospital between May, 1920, and March, 1922. The remaining five cases are well at the present time, and there has been no death in the series, which includes one case of resection of ileum in a boy aged 14 years (specimen shown). [See Table of Cases.]

No.	Sex	Age	Duration of illness	Type	Remarks	Days in hospital	Food
3	M	6 mo.	36 hours	Ileocolic	Appendicectomy; no mass felt	21 days	Breast fed
4	M	11 mo.	48 hours	Ileocolic	Paracolic inflamed glands removed for section. Report: acute inflammation and necrosis; mass felt	12 days	Breast fed
5	F	10 mo.	4 days	Ileocolic	Ileocolic valve protruding at anus	15 days	Breast fed
7	M	14 yr.	4 days	Ileo-ileal, ileocolic	Appendix removed November 15; gangrenous resection and lateral anastomosis; mass visible (specimen)	25 days	—
8	M	3 mo.	20 hours	Ileocolic	Splenic flexure appendicectomy; sausage-shaped mass	11 days	Breast fed
10	M	6 mo.	10 hours	Ileocolic	Splenic flexure; appendicectomy	13 days	Breast fed

Two Cases of Bone-regeneration after Osteomyelitis.

By A. P. DODDS-PARKER, F.R.C.S.

(1) THE specimen exhibited is that of the diaphysis of a femur, which I resected sub-periosteally in a girl aged 9 years in 1915. (The successive stages of bone regeneration were shown by lantern slides of skiagrams.)

(2) The case is that of a boy aged 7 years, in whom a large portion of the shaft of the tibia has been resected for osteo-myelitis. I have twice grafted the gap with a graft from the opposite tibia, the second being successful. (The patient was shown, and demonstrated the restoration of function of the limb.)

Case for Diagnosis : Persistent Stridor.

By F. G. GARDNER, M.R.C.S.

FEMALE, aged 5½ years, was operated on in hospital in May, 1921, for "tonsils and adenoids," and made a good recovery. A short time later inspiratory stridor was noticed and has persisted ever since, almost without intermission night and day, waking and sleeping. The child was admitted to hospital, and also attended as an out-patient for a considerable time, but no definite diagnosis was arrived at. Enlarged bronchial glands were suspected. The larynx was examined with a negative result.

Present condition : There is marked stridor, with some cough, the voice is hoarse, and the timbre is almost adult in quality. There appears to be slight difficulty in swallowing and some dribbling takes place. The tongue shows fine tremors and the mucous membrane is thrown into folds suggesting muscular atrophy. There has been some loss of weight, but the general health is good and the child is cheerful and active. No abnormal signs in chest.

DISCUSSION.

Dr. BELLINGHAM SMITH considered the case in many respects the most interesting shown during the day, and suggested that the condition might be bulbar in origin.

Dr. H. PATERSON mentioned a case of a similar nature, in which *post-mortem* localized anterior polio-myelitis had been found.

Dr. SANKEY showed several skiagrams including:—

- (1) Transposition of Viscera in a Child aged 3 years (by Bismuth meal).
 - (2) Bilateral Schlatter's Disease (boy aged 7 years).
 - (3) Various Congenital Defects of Limb Bones.
-

THE Regius Professor of Medicine, Sir A. E. GARROD, K.C.M.G., described a case of *Hæmatoporphyrinuria* with Pink Teeth.

Practical Methods of the Treatment of Infantile Paralysis in Children.

By G. R. GIRDLESTONE, F.R.C.S.

(ABSTRACT.)¹

THE following is a demonstration of some of the methods of splintage, posture treatment, and of application of simple walking appliances used in the Wingfield Orthopædic Hospital, Oxford, and its surrounding out-patient clinics.

This demonstration is in some degree supplementary to the address on the treatment of infantile paralysis given by the President of the Section some weeks ago.²

The subject has rather special importance at the present time as the Education Act of 1918 has authorized the expenditure of money by Local Authorities on the treatment of children of school age. This has been of great financial assistance in the way of providing treatment, but as it is an expenditure of public money it is necessary that the methods employed should be as economical and effective as possible.

The cases shown illustrate the methods of treatment employed at the various stages of the disease.

FIRST STAGE.

The child shown is completely wrapped in cotton wool and bandaged on a Thomas's double spinal frame with a thick soft saddle and a head-piece. This splintage, which is applied whenever possible at the very onset of the disease, and is kept up continuously for six weeks or longer in serious cases, supplies an almost complete degree of rest to the affected ganglion cells, both from reflex stimulation associated with skin stimulation or joint movements, and from the efferent stimuli concerned with active movements. At the first stage of infantile paralysis rest as complete as possible should clearly be given to the inflamed or poisoned ganglion cells; it is probable that very much can be done towards effecting the ultimate recovery of the patient by the prompt provision of a thick protective layer of cotton wool and thorough immobilization of the head, spine, and affected limbs. Frequent restless movements are avoided and the children soon lie contented and quiet. The feet are kept at right angles in plaster over thick wool padding, or on splints. The position of the anterior superior iliac spines is frequently verified to make sure that the pelvis remains true.

SECOND STAGE.

The principles to be applied at this stage are:—

- (1) Postural treatment of the trunk and limbs.
- (2) Correction of deformities, if any have developed.
- (3) Restoration of ganglion cell activity, induced by: (a) Skin stimulation by light massage; (b) muscle group re-education; (c) locomotion without overstrain.

These principles are applied carefully and in the order as stated.

¹ This paper will be published in full in the *British Medical Journal*.

² See *Proceedings*, 1922, xv (Sect. Study Dis. Child.), p. 35.

(1) *Postural treatment*.—This is guided by: (a) The distribution of the paralysis, i.e., the protection of weak or paralysed muscles from overstrain; (b) the need for safeguarding certain "key" muscles.

The patients now shown are wearing simple splints ensuring the desired posture, the muscles particularly favoured being the deltoid and the median thenar intrinsics in the upper limb, and in the lower the glutei and the quadriceps.

Attention is drawn to the simplicity of the various apparatus. During the whole of the second stage, which may last for years, no hinged apparatus is used. The simple abduction splint, the walking caliper, double side irons, with plaster and an occasional celluloid splint satisfy the needs of the limbs.¹

Where the trunk muscles are very weak a light spinal support is applied. Several children now demonstrated are seen to be walking fairly well with two calipers and a light spinal support, but paralysis was originally so extensive that they were thought to be hopelessly bedridden. They thus get about and go to school, while the weak or paralysed muscles are protected from overstrain.

(2) *Correction of deformity*.—This is almost always done by repeated plasters, but in late cases of paralytic scoliosis corrective or supporting splintage is applied very carefully and any limitation of the already enfeebled respiratory movements is avoided so far as possible. Murk Jansen's method is often used (his plaster bed, and, at a later stage, his light scoliosis support).

(3) *Restoration of activity*.—During this process the case is carefully watched. Exercises are always kept within the range of the muscular power and when locomotion is recommenced the greatest watchfulness is necessary. This is especially the case with the quadriceps and, although the caliper is never removed until Mackenzie's final test is satisfied, it is occasionally necessary (even after that test) to re-apply the caliper for some months owing to a gradual weakening of the quadriceps due to the strain of walking without its support.

THIRD STAGE.

The second stage passes into the third when the results of treatment have distinguished the muscles that are recoverable from those that are permanently paralysed. The patient's capabilities are now developed, whether by operation, such as joint stabilization and tendon transplantation, or by suitable appliances: but operations such as arthrodesis are postponed until after the age of 8 or 10 years. Neither knee- nor ankle-joint is ever fixed by arthrodesis.

The whole demonstration serves to show what can be done for paralytic cases by simple and cheap appliances. The apparatus used is economical both in first cost, for it does not require difficult measurements or repeated fitting, and in maintenance, for it is strong though light and without fragile or complicated joints. The appliances enable the children to walk and, at the same time, protect the paralysed or weakened muscles from overstrain or overstretching.

¹ All the apparatus used is made in the hospital workshops. Duralumin is used extensively and with very satisfactory results. Any appliances, except celluloid splints, can be finished and fitted within a week of the order.

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Clinical Section.

President—Sir WILLIAM HALE-WHITE, K.B.E., M.D.

Case of Renal Dwarfism with Optic Atrophy.

By A. FEILING, M.D., and W. L. HOLYOAK, M.D.

BOY, aged 12½, came under observation for defective vision in left eye. Is said to have had whooping-cough at age of 4, after which the sight became worse and the legs became crooked. Present condition: Height, 43½ in.; weight, 3 st. 13 lb. 8 oz. Mental state quite normal. Left eye: Vision reduced to perception of large moving objects only: primary optic atrophy in left eye. Right optic disc is pale, but vision is $\frac{6}{6}$, and $\frac{6}{6}$ with correction. Visual field in right eye full.

Very marked degree of genu valgum in both legs.

Urine: Amount has varied from 26 to 40 oz. in twenty-four hours. Specific gravity 1012, acid, clear: constant albuminuria. Amount of albumin, 0.25 per cent., or 1.1 gr. per ounce. A few hyaline and granular casts found.

No definite cardio-vascular changes; blood-pressure is 95 mm. Hg. systolic and 70 diastolic. Wassermann reaction in the blood negative. Cerebro-spinal fluid: Wassermann reaction negative; cell count, 2 to 3 per cubic millimetre; no globulin.

X-ray examination of sella turcica (Dr. Gilbert Scott): The sella turcica is small and ill-developed, but otherwise no definite abnormality can be detected.

Radiogram of knees exhibited.

Case of Injury of Pituitary Gland.

By H. L. TIDY, M.D.

THE patient, a male, aged 25, received a bayonet wound through the left lower eyelid in 1915, and immediately lost consciousness. On recovery of consciousness, he felt thirsty, and thirst and polyuria have persisted ever since.

Present condition: He is much below normal weight and the skin is very dry. He passes from 180 to 320 oz. of urine daily, the urine containing no sugar or protein, and no glycosuria is produced by the administration of 250 gm. glucose. Primary optic atrophy on the left side. No injury to the globe. X-ray examination reveals no evidence of any injury, nor any recognizable abnormality.

Two Cases of Pulmonary Disease presenting Difficulty in Diagnosis.

By G. A. BACK.

CASE I.—? APICAL EMPYEMA.

MAN, aged 39, with no familial or previous history of pulmonary complaint. On August 15, 1921, he had an attack of sharp pain, increased by coughing and deep breathing, in the left side of his chest. This continued for three days, during which period he felt out of sorts, lost his appetite, but continued his work. On August 19 he began to rest at home, noticing that he was short of breath, had a slight cough with white sputum, and that his pain had become more dull and aching. He returned to work after ten days, but as the pain still continued he reported at St. Thomas's Out-patient Department on September 7.

His physical signs were confined to the area of chest wall between the left clavicle and the upper border of cardiac dullness. Where the percussion note was dull breath sounds were extremely faint, and vocal resonance and fremitus were absent. The heart was not displaced. The pulse was 72, and blood-pressure 120 in both arms. There were no dilated veins. The fingers were definitely clubbed. The lymphatic system was not apparently involved, and there was no alteration in the voice nor inequality of the pupils.

During a month's observation in hospital these physical signs have not changed. The patient has gained 2 lb. in weight and experiences little pain. There are no night sweats nor rigors, the evening temperature varying between normal and 101° F., and the morning temperature being usually normal. There is very little cough or sputum, and no hæmoptysis. The X-rays showed an opacity of the upper two-thirds of the left side of the chest, and diminution of expansion, suggesting thickened pleura or encysted fluid. Wassermann reaction negative. Leucocyte count, 22,000; 85 per cent. polymorphs. No eosinophilia. Exploratory puncture in second space did not reveal any pus. A further X-ray photograph on October 5 showed no alteration in the appearances.

With regard to the differential diagnosis, the physical signs can be explained either by encysted fluid in front of the apex of the lung, a solid mass in the same position, or occlusion of a bronchus. Of possible fluids, hydatid or other cyst seems improbable, whereas the diagnosis of an apical empyema is supported by the sudden onset, the leucocytosis, and the pyrexia. On the other hand, there appears to be no adequate reason why an empyema should be formed in this region, unless it followed an ambulatory pneumonia in the same position, which must be very rare. Moreover the exploratory puncture was negative. A mass between the lung and the chest wall might be produced by actinomycosis. It does not commonly affect the apex, however, and in any case is usually accompanied by a good deal of expectoration, and also tends to invade the chest wall. Of new growths which may occur in this position, endothelioma of the pleura is rarely so localized. A mediastinal sarcoma might spread along the lymphatics of the lung and form large masses underneath the pleura, and in addition might occlude bronchi as it spreads. The gain in weight and the sudden onset does not necessarily exclude malignant disease

in this region, as both these phenomena have been observed in cases of mediastinal sarcoma. The leucocytosis might be explained, for the purposes of this diagnosis, by a secondary infection of the growth.

CASE II.—PLEURAL EFFUSION. ? CAUSE.

Patient, a man, aged 41, who was discharged from the Army in March, 1919, in category A1. A year later he began to suffer from dyspepsia, and in August, 1920, felt a dull, aching pain in the left hypochondriac and lumbar regions. In December the same year he was admitted to the London Hospital and 4 oz. of clear fluid were removed from his left pleural cavity. No tubercle bacilli were found. The pain continued and in March, 1921, he was treated in the Homœopathic Hospital, where his left pleural cavity was again aspirated: 30 oz. were removed at each aspiration, the fluid being clear on the first and blood-stained on the second occasion. On July 30 he was admitted to St. Thomas's Hospital. The left side of his chest was flattened and immobile, and showed all the signs of fluid up to his third rib, and this was confirmed by X-rays. The heart was displaced to the right, otherwise the right side of the chest was normal. On August 15 a pint of dark blood-stained fluid was removed, and again on September 16, when a portion of the fluid was injected into a guinea-pig, which has since been found free from tubercle.

The physical signs have remained almost the same since admission; there has been no pyrexia and no loss of weight. Cough and sputum were noticeably absent.

I think the diagnosis must lie between tubercle and malignant disease. The absence of signs in the right lung, and of cough and pyrexia, as well as the negative findings in the guinea-pig, contra-indicate the first suggested diagnosis, whereas the long history, over twelve months, and the absence of any signs of pressure on or invasion of other organs are against a diagnosis of malignant disease.

Clinical Section.

President—Sir WILLIAM HALE-WHITE, K.B.E., M.D.

Case of Dysostosis Cleido-cranio- (digitalis).

By C. E. SHATTOCK, M.S.Lond., F.R.C.S.Eng.

PATIENT, a girl, aged 6 years 8 months. No history of the condition being hereditary. She has one brother, aged 5½, apparently normal. General condition of patient fair. Hair dry and coarse. Facies mongoloid. Mentality good. Palate high arched and narrow. Muscles of shoulder-girdles and upper limbs poorly developed. Chest narrow from side to side. Fontanelle now closed: there is a history that it remained open for a long time. Right shoulder held lower than left. Shoulders can be brought together anteriorly. Right clavicle shows an absence of bone in its middle third, being here represented by a fibrous band. Left clavicle shorter than normal, appears to be bony, and is loosely articulated with sternum and acromion. Toes stunted. Nails of fingers and toes short.

X-ray Examination.—Skull: Thinning of bone in region of bregma; stunted development of nasal bones; absence of frontal sinuses. Clavicles: Imperfect ossification, more marked in right clavicle, where there is absence of bone in middle third. Toes: Absence of epiphyseal centres in phalanges; abnormal breadth of phalanges of hallux; poor development of ungual tuberosities. Fingers: Irregular epiphyseal lines in some of the intermediate and terminal phalanges; proximal and distal epiphyseal centres in second and fifth metacarpals; poor development of ungual tuberosities.

Case of Adolescent Coxa Vara after Correction of Deformity.

By H. A. T. FAIRBANK, D.S.O., M.S.

P. R., MALE, now aged 17. Attended first in March, 1920, with history of a severe fall in the previous July when he sustained a fractured base of the skull and grazed the left hip. No gross injury of the hip was noted at that time. He completely recovered and was well till Christmas, when he began to limp and complain of pain in the left knee on walking. Laid up for ten days. Pain disappears on lying down.

Examination: Left leg extended and distinctly externally rotated; no fixed flexion and very little movement in any direction. Trochanter raised and thickening over neck of femur in front. Shortening 1 in. Well developed for his age, but was said to have had rickets in infancy. *X-ray:* Adolescent coxa vara with marked displacement of head of femur without signs of union in abnormal position.

Admitted at once and treated with extension and daily increasing abduction and internal rotation. In a fortnight full abduction was obtained and radiogram showed complete restoration of normal position of head and neck of femur. Plaster applied from ribs to toes on left and to knee on right, left leg being in the above-mentioned position. Plaster retained for over two months. At the

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end of three months allowed up on walking calliper splint. Splint discarded nine months later.

Shortening: On removal of plaster $\frac{1}{4}$ in. In March last $\frac{1}{2}$ in. Now 1 in.

Recent radiogram shows head fused to neck in normal position on left, while on right epiphyseal line is still present, and neck is longer and slightly valgoid as compared with left. He now walks with comfort, but there is very slight limp due to the shortening. Abduction and rotation normal, but flexion is still checked at 60°. Unusual prominence in front of trochanter, apparently due to hypertrophy of the tensor fasciæ femoris, remainder of thigh being slightly wasted.

It is suggested that the present shortening—which has been gradually increasing since the plaster was removed—is due to the fact that growth ceased over a year ago in the neck of the left femur, while it is still progressing in the right.

Case of Partial Pyloric Stenosis (Hypertrophic); Finney's Operation.

By R. P. ROWLANDS, M.S.

PATIENT, G. W., aged 32. The patient has supplied the following details of the early history: "Pain began about nine years ago (1912) on and off, after food, until 1915, when I first started vomiting, having about three attacks in that year lasting a week each time they occurred. In the following year (1916) my service in the Army began and from then onwards I had pain and vomiting after the least exertion. I was admitted into hospital at various times with these attacks as gastritis, and after rest and light diet was much better. After a short time they would recur. Since my discharge in 1919 they became more frequent—about every month—lasting, on an average, ten days to a fortnight, until my operation was performed.

"Symptoms: Pain about two hours after food, which would *increase* until I vomited, when pain became less. This would occur three or four times a day for from ten to fourteen days.

"Vomit was sour and curdled and in large quantities."

I first saw the patient at the Second London Hospital in June, 1918, when I removed his appendix, having felt the stomach, duodenum and gall-bladder from the wound and found no abnormality. X-ray examination of the stomach was negative. I next saw him in June, 1921, when the frequency of his attacks and the amount of vomiting had increased, and he had wasted considerably. The frequent recurrence of symptoms threatened to spoil his life and lose him his appointment as clerk. He was therefore admitted to Guy's Hospital for further investigation.

Chemical analysis showed no abnormality in the gastric function: the X-ray showed a hypertonic, very dilated stomach with delay, but no evidence of gastric or duodenal ulcer or pyloric stenosis.

I concluded from this that the patient had partial pyloric stenosis of the spasmodic or hypertrophic variety, and urged operation.

Operation, June 9, 1921: Thorough exploration of the abdomen revealed no abnormality except a greatly dilated and moderately hypertrophied stomach and a greatly thickened and widened pyloric ring over which the stomach was cedematous. This cedema extended for about 2 in. into the pyloric antrum.

I could feel no ulcer in the duodenum, stomach or pylorus. I was able to pass my index finger through the pylorus quite easily, after invaginating the anterior wall of the stomach. The second part of the duodenum was adherent to the liver and the adhesions tended to obstruct it. I mobilized the duodenum, separated the adhesions and performed Finney's operation, enlarging the pylorus to 3 in. in diameter. The pyloric muscle was $\frac{1}{2}$ in. thick and over $\frac{1}{2}$ in. wide. The mucous membrane showed a marked fold on the lower margin of the ring. Catgut was used throughout the operation.

It is now five months since the operation. The patient has not vomited since and has put on flesh to an amazing extent. He is entirely free from pain and thoroughly enjoys his food.

This is a typical instance of partial stenosis due to spasm and hypertrophy of the pyloric sphincter. The condition was described many years ago by Mr. Ernest Maylard and others. Mr. Maylard has operated in about thirty-five instances: I have operated in about a dozen.

In many cases, as in this one, there is a marked infolding and thickening of the submucous tissue at the pylorus, partly obstructing the channel, but there is no sign of active or healed ulceration. The diagnosis is difficult, for the patient is usually quite well and the stomach normal in the interval between the attacks, which, however, become more frequent and ultimately dilatation of the stomach replaces moderate compensatory hypertrophy. Then, or during the attack, an X-ray examination reveals dilatation and delay, but no sign of ulceration. The clinical history is characteristic, the patient being well while at rest and under observation in hospital, and the attacks coming on after undue exertion or fatigue.

I suggest that some form of gastro-duodenostomy is the ideal treatment of this condition, for, unlike gastro-jejunostomy, this operation carries no risk of vicious circle or jejunal ulceration, and it does not materially change the normal anatomy and physiology of the stomach. I have generally adopted Finney's method of gastro-duodenostomy, at which the pyloric sphincter is divided and the pyloric opening greatly enlarged. My results have been uniformly satisfactory.

It has been suggested that this condition is a congenital abnormality—a persistence into adult life of a congenital hypertrophic stenosis—which is at first of such a moderate degree as to be compensated by hypertrophy of the stomach muscle; later this balance is upset and the stomach gradually fails and dilates.

Would Ramstedt's operation, which has been so successful in infants, be suitable for this analogous condition in adults? I think not, for the fibrous changes in the pylorus—especially in advanced cases—call for the more radical operation.

Case of *Adiposis Dolorosa*.

By BERNARD MYERS, C.M.G., M.D.

MRS. H., married, aged 44, came to the Royal Waterloo Hospital last October complaining of increasing general weakness. She was found to be distinctly fat, but the face, hands and feet appeared practically normal in size. Weight 15 st. 11 lb., and height about the average. Patient was quite thin until the age of 22: since then she has become gradually stouter. The only disease of childhood was measles. Three years ago an operation for strangu-

lated umbilical hernia was performed on her, and she states that subsequently she has suffered from swellings of the legs during the daytime, which subside at night. The arms and legs became painful to the touch about a month before coming to hospital; this symptom has now passed off except upon pressure in certain areas.

She was a cook from 14 to 30 years of age, was married at 30, and has had three children, all living and healthy; no miscarriages. Father and mother always quite healthy and not unduly stout; mother still alive. She is the eldest of fifteen children; all the others are thin.

On account of her weakness the patient was admitted to the wards; further examination showed the abdomen to be uniformly rotund when she was lying down; when she sits up or stands, the lower part of the abdomen forms a kind of apron which hangs to a slight extent over the upper parts of the thighs and pubes. The breasts are large and pendulous, and show some large veins. The upper part of the chest and arms are well covered with fat; folds of fat are present in the axillae. When the arms are held horizontally masses of fat hang from the posterior surfaces of the upper arm. The general excessive fatty covering diminishes practically to the normal amount about 2 or 3 in. above the wrist. The hands are of normal size, but the fingers are spindle-shaped, the roots being distinctly enlarged. On the posterior surface of each upper arm just above the elbow there is a harder mass about the size of a hen's egg, which is tender to the touch and distinctly painful upon slight pressure, which she states is worse in cold weather. The pain is localized and does not radiate in any direction. The face and head, and to a less extent the neck, are of normal size. The buttocks are enlarged, the thighs and legs greatly increased in circumference down to the ankles, where the increase ceases abruptly, the feet being of practically normal size. About the middle of the inner surface of each calf there are masses tender and painful to the touch, the pain being increased with pressure; the right one is nearly round, about 3 in. in diameter, and it feels thick and hard. On an almost corresponding position on the left leg there is a small roundish area about 1 in. in diameter, also very tender and painful; pain does not radiate from these masses. The fronts of the legs are just a little tender. Pressure over the tibiae makes no impression. There is no pain on moving any of the joints.

Patient has been very weak for about three months, and finds it difficult to walk about on account of the feeling as if her legs are going to give way. The arms are not apparently weak. They and the legs are much more painful when she is up than when she is lying down. In the recumbent position she has greater feeling of giddiness and dizziness in her head than when she is up. Some pain always present over each temple. For a few weeks she has felt a little sick. Formerly she used to be irritable, but not now. Occasionally there is depression, but not more than previously. During the last few months awakenings with a start from sleep have occurred rather frequently. When first seen she had complete left hemi-anæsthesia; this has now passed off.

Her organs are difficult to examine, but no abnormality has been discovered. Dr. Bickerton has examined her eyes and found them normal. Mr. Biggs pronounced the ear, throat and nose, and Dr. Cameron the pelvic organs, to be normal. The pulse has varied from 72 to 100; the temperature normal or 1° F. up; the respirations 25; bowels open daily, and appetite good.

Dr. H. E. Archer made a sugar tolerance test as follows: Blood sugar before taking glucose, 0.142 per cent.; quarter of an hour after taking 50 grm. glucose, 0.213 per cent.; in half an hour, 0.311 per cent.; in one hour, 0.314

per cent.; in one and half hours, 0.300 per cent.; in two hours, 0.183 per cent. The urine before glucose test showed absence of sugar, and it was still absent after the test. Dr. Archer states: "These results show (1) that the patient has a hyperpituitarism; (2) that her sugar tolerance is increased in that although the blood sugar rises to the high figure of 0.314 per cent., there is no sugar excreted in the urine. This high level is followed by a very gradual fall which in two hours has not reached the fasting level. This high figure and delayed fall, without a corresponding degree of glycosuria, are characteristic of an abnormal condition of the pituitary gland."

Her sella turcica is stated to be larger than normal, but without evidence of disease. The Wassermann reaction was negative.

The general increase of subcutaneous fatty tissue with larger masses in certain areas, the symmetrical painful nodules in the fatty tissue, the absence of apparent fatty increase in the face, the hands and feet, the great weakness, and some suggestively hysterical symptoms, are in favour of a diagnosis of Dercum's disease. The pituitary gland has been proved to be abnormal in this case, but there are so far no definite signs of a cerebral tumour.

She has been kept in bed for three weeks and given pituitary extract, 1 gr. at mid-day, and thyroid gland, 1 gr. night and morning after meals. Paraffin also night and morning. She states that she feels much better generally and distinctly stronger. The hemi-anæsthesia and headache have disappeared, and she believes that the nodules are less painful. It will be an interesting case to watch

Two Sisters with Gouty Nodules.

By M. A. CASSIDY, M.D.

THESE two sisters, M. M. and I. S., are aged 39 and 43 respectively. There is no family history of gout or rheumatism, and they themselves have always enjoyed excellent health, and have been quite free from arthritic pains; they have never had fibrositis nor neuritis. In each case during the last ten years there has been the gradual appearance of small, hard, subcutaneous nodules along the extensor tendons for a distance of from 1 to 2 in. above and below the knuckles. The nodules are the size of a small pea and there are rows of three to five along each tendon on the back of the hand. A few nodules are also present on the extensor tendons of the toes, under the skin over the patellæ and over the tubercle of the tibia. There is evidence of chronic thickening of the olecranon bursæ in each case. The nodules are neither tender nor painful; in appearance they resemble rheumatic nodules, but differ from the latter in not being fleeting; in these patients the nodules do not come and go; once they appear they remain, increasing gradually but very slowly in size. There are no tophaceous deposits on the external ears and there is no sign of any disease, recent or past, of any joint. In one patient (I. S.) the nodules and the olecranon bursæ of the right arm were excised by Mr. C. M. Page. Crystals were visible in the cut section of these nodules, and were identified chemically as uric acid. Histologically the appearances were those of chronic inflammation, with much fibrosis.

The other patient (M. M.) has been treated with agotan, but without obvious result so far.

Though gouty nodules along the course of tendons are by no means uncommon in chronic tophaceous gout, their appearance as a solitary manifestation of gout, in two sisters, beginning at the early age of 30, is remarkable.

Clinical Section.

President—Sir WILLIAM HALE-WHITE, K.B.E., M.D.

Three Cases of Cirroid Aneurysm.

By PHILIP TURNER, M.S.

CASE I.

PATIENT, a girl, aged 10, was admitted to hospital for pulsating swelling under the left eye. This was first noticed in July, 1921, when the lower eyelid also became dark and discoloured. There has been no pain, and she is not inconvenienced by the swelling. The only history of injury is that on November 5, 1920, patient was hit on the left cheek by a firework; this was apparently quite trivial, and only caused for a time some superficial redness of the skin.

The left lower eyelid is now slightly swollen and discoloured, giving somewhat the appearance of an old "black eye." The swelling pulsates and a distinct thrill can be felt, most intensely at the infra-orbital foramen; there is also a loud systolic bruit. A tortuous, dilated, pulsating vessel can be distinctly felt, and there is excessive pulsation in the course of the angular and the transverse facial arteries. There is puffiness extending backwards to the left parotid region. No exophthalmos; conjunctiva of lower lid unaffected; pupils normal. Pressure on angular and transverse arteries does not stop pulsation; but pulsation, thrill, and bruit immediately disappear when the external carotid is compressed.

Postscript.—December 11: Common carotid ligatured, the immediate result being diminution of swelling and disappearance of pulsation, bruit and thrill. Later on some pulsation returned, and about the tenth day after operation a slight thrill could be felt. On discharge from hospital, swelling was much less; discoloration had decreased; and there was a slight degree of pulsation, but no thrill or bruit.

CASE II.

Mrs. E. M., aged 24, attended out-patients' department on December 1, 1921, for swelling of right upper eyelid. Had been operated upon at Bristol Royal Infirmary for cirroid aneurysm upon two occasions, tumour being excised. When seen, the swelling, which was of only a few days' duration, was so great that the eyelids could not be separated, the cause being œdema secondary to sepsis around an eyelash follicle. This rapidly cleared up with fomentations, and the ordinary condition of the eyelid could be seen. There was some hypertrophy and discoloration, a little pulsation, but no bruit or thrill. Though one hesitates to say that the condition is cured, there is undoubtedly a very great improvement, and the patient is well content with the result of the treatment.

CASE III.

Patient, a female, aged 24, admitted in August, 1920, for large pulsating swelling of right external ear, extending to mastoid and parotid regions. The swelling had been present since infancy, but had greatly increased in size during the preceding eighteen months. Right ear greatly hypertrophied, much thicker and larger than left ear: it was hot and red. Tortuous dilated pulsating vessels could be felt extending to mastoid region behind, and to parotid region

in front of the ear. Well marked systolic bruit present, and a thrill could be felt in ear and over mastoid.

Treatment: Ligation of the external carotid artery. It was intended that this should be a preliminary measure, and later on a large incision should be made over the mastoid, the ear turned forwards, and the affected vessels secured and ligatured. The operation was, however, followed by shrinking of the swelling and complete disappearance of the thrill and pulsation. The improvement was so marked that the latter part of the treatment was not carried out.

Present condition: Nearly eighteen months after the operation, the right ear, though still larger and thicker than the left ear, has decreased in size; and, though there is some pulsation, the thrill and bruit have disappeared.

Though one cannot regard the result as a "cure," the operation has resulted in great improvement, and the patient herself is quite content with the result of the treatment.

Case of Exomphalos closed by Operation, and a Specimen of a similar Case in which Closure was impossible.

By W. H. OGILVIE, M.Ch., F.R.C.S.

THE two cases shown were admitted into Guy's Hospital on the same day, a sufficiently striking coincidence. Both were admitted under the care of Mr. Rowlands.

(I) THE OPERATED CASE.

C. E. M., male infant, was brought to the out-patient department two hours after delivery, and immediately admitted. Healthy in all respects, except for a swelling the size of half a coco-nut, occupying anterior abdominal wall, and covered with grey translucent layer of Wharton's jelly. Just below its centre umbilical cord proper came away. Swelling expanded at each inspiration. Skin of abdominal wall stood like a collar round edge of the swelling, stopping sharply $\frac{1}{4}$ inch from margin. No other congenital abnormalities.

Progress: As the covering was intact, it was hoped that pressure might reduce some of the contents of the swelling into the abdomen, and facilitate closure. The swelling was covered with an antiseptic powder and a firm binder applied. Forty-eight hours later the walls showed signs of giving way, not from pressure, but from the appearance of a physiological line of demarcation at the junction of the epidermis and the cord tissues.

Operation: Elliptic incision was made at margin; skin flaps dissected back for 2 in. Swelling opened, and chief content was found to be the liver, which was globular, and entirely outside abdomen. Liver adherent widely to coverings, and especially to upper margin of opening. Gall-bladder on its deep or dorsal surface. Lower part of swelling was occupied by stomach and small intestine. No large intestine could be seen, but it probably lay, as in specimen, entirely in left lower quadrant. Inferior vena cava could not be seen, but Professor T. B. Johnston tells me that in a specimen of exomphalos which he investigated, hepatic vein opened direct into right auricle, and blood from the lower limbs reached heart by azygos veins. Adhesions to liver were all divided, and coverings dissected away. Umbilical vein had to be ligatured above the two hypogastric arteries and urachus below. Recti could be felt lateral to margins, and edge was trimmed to within $\frac{1}{4}$ in. of them. By pulling up lateral walls strongly with Lane forceps contents were reduced with difficulty, and abdominal wall closed in two layers with mattress sutures.

After-history: Uneventful, but child still weakly. The scar still shows a mild infection. After closure, two very large congenital hydroceles developed, but disappeared under treatment.

(II) THE SPECIMEN FROM SECOND CASE.

This infant, a male, was admitted also two hours after delivery. In this case, however, coverings had ruptured during or before birth, and all the viscera seen were exposed. Intestines were bright red and already somewhat distended, showing a degree of inflammation suggesting intra-uterine rupture of coverings. Abdominal walls were more retracted than in case already shown. This, and the distention of intestines, rendered closure impossible.

Child lived two days in this condition, feeding well, and passing urine and meconium.

It is well developed, showing no abnormality except the exomphalos. The liver is the most prominent organ, and is globular. A patch of adherent Wharton's jelly is seen on its surface. Stomach normal in position. Large intestine has not rotated, and lies entirely on left side. Abdominal cavity extremely small, and in it the kidneys may be felt. Diaphragm normally developed.

Exomphalos differs entirely from umbilical hernia from the fact that the viscera contained in it have never been inside the abdomen, and being unsubjected to the normal stress and pressure of surrounding organs, they do not develop along normal lines. This is illustrated by the globular shape of the liver in these two cases. The abdominal wall is absent over the swelling, the coverings being amnion, Wharton's jelly, and peritoneum. Exomphalos is present in about one birth in 6,000.

The points of interest in these cases are:—

(1) That an abnormality of this magnitude can exist in an infant otherwise healthy and well developed, and is amenable to successful surgical treatment. In many developmental abnormalities, such as spina bifida, it cannot but be felt that treatment, if successful, only serves to prolong the life of an infant whose future existence is of doubtful value. But there is no reason why this child should not live to be a healthy and useful member of the community, and his strangely disposed viscera will be of no disadvantage to him unless he has to undergo a subsequent laparotomy.

(2) The treatment advocated in text-books is that operation should be postponed for some weeks, up to six months. It seems clear that this advice is based on tradition rather than practice. The amnion covering the swelling is adapted to survive in a fluid medium, and, once the child is exposed to air and the placental circulation cut off, is cast off at its junction with the skin by a natural process of separation. This process cannot be delayed by antiseptic dressings, and operation, if feasible, should therefore be undertaken as soon as possible, while the tissues are sterile and the intestines not distended by food.

(3) A Meckel's diverticulum is said to be found in most instances. It is absent in both the cases shown.

Case of Ectopia Vesicæ.

By R. P. ROWLANDS, M.S., F.R.C.S.

PATIENT, a girl, aged 9, has complete exstrophy of the bladder with great separation of the recti and pubes, but no apparent associated congenital abnormalities. No operation has been performed. The greater part of the

posterior wall of the bladder projects forwards and forms the anterior wall of a large ventral hernia. She is shown for advice as to treatment.

It seems hopeless to attempt to make a complete bladder by uniting the lateral margins (after Trendelenburg), by skin flaps (after Wood), or by grafting the cæcum, for neither expulsive power nor control will be thus provided, and the patient will be worse off than before, stones tending to form in the very imperfect bladder thus made. Diversion of the ureters into the vagina cannot be recommended, for again control is not obtained. Some method of diversion of the urine into the large bowel seems more attractive and hopeful. Projecting the ureters into the rectum or colon is so apt to be followed by ascending nephritis, or some obstruction at the ends of the ureters, that it does not seem preferable to transplantation of the trigone into the bowel. Coffey and Stiles have implanted the ureters obliquely in the colon after Marwedel's and Witzel's method of gastrostomy respectively, thus hoping to form an efficient valve and prevent ascending infection. The operation is generally done in two stages, with an interval of three weeks; the right ureter is projected into the ascending colon and the left into the pelvic colon. Implantation of the trigone, however, seems preferable so far as the avoidance of both infection and obstruction is concerned, the natural, inimitably perfect valve at the end of the ureter being retained. The subperitoneal operation, after Moynihan's method, is not possible in females, but good results have been obtained from it in males. The hernia in this patient's case would also interfere with the efficacy of this method.

We are left, therefore, with Maydl's operation (improved by Peterson) of implantation of the trigone into the pelvic colon. An ellipse of the bladder base is joined by through-and-through sutures to the edges of a longitudinal opening in the pelvic colon, and the peritoneum is brought snugly round the ureters by Lambert sutures, thus completely burying the trigone and lessening the risk of peritonitis. This operation can be done in one stage. Its immediate mortality appears to be about 20 per cent., as shown by the collections of cases made by Orlov and others.

Without operation the condition of these patients is truly miserable, and half of them die before they are 10 years old, mostly from ascending nephritis, their ureters being generally dilated, their kidneys hydronephrotic or calculous, and one of them may be withered. The use of apparatus to collect the urine is usually very unsatisfactory by night, and offensive by day. Clearly, therefore, it is worth running considerable risks in the hope of obtaining relief.

When the urine is diverted into the pelvic colon or rectum, expulsive power and control of urine are good, but not perfect, micturition occurring separately from defæcation about every four hours by day; there may be occasionally some incontinence by night.

Postscript.—At the operation, a few days after the meeting, I tried to catheterize the ureters, using No. 1 catheter, but failed. I then dissected away the posterior wall of the bladder, having opened the peritoneum and dissected into the sub-peritoneal tissue to find the ureters, both of which were rather thick, but not apparently dilated. The uterus was very small. Having isolated the whole of the bladder except its peritoneal covering, I then shaped it into an ellipse and joined it with two layers of catgut sutures to the front of the middle of the pelvic colon; I then closed the abdominal and pubic wounds, but with difficulty. The patient did very well until she contracted scarlet fever, from which she died a month after the operation.

Clinical Section.

President—Sir WILLIAM HALE-WHITE, K.B.E., M.D.

Periosteal Sarcoma of the Temporal Bone treated by Diathermy.

By R. DAVIES-COLLEY, C.M.G., M.Ch.

PATIENT, a male, aged 61, came to out-patient department at Guy's Hospital in January, 1921, with a hemispherical tumour of the left temporal fossa, the base of which measured about 3 in. in diameter and was clearly attached to the bone. It had been growing for five months and was quite painless. Wassermann test negative. X-rays showed indefinite blurring of outline of skull in region of tumour. A small piece removed for section had the typical histological structure of a round-celled sarcoma. It was obviously impossible to attempt a radical operation for its removal, and on February 10, 1921, as a forlorn hope I decided to scrape away as much of the growth as I could and expose the base to the action of diathermy. In removing the growth I found that all the bones of the temporal fossa were deeply eroded, though apparently not perforated. The wound healed rapidly, though there was a fair amount of inflammatory reaction, which left an area of induration in the parotid region that has persisted. Since leaving the hospital the patient has been attending regularly once a week for X-ray treatment.

It is now eleven months since the operation and there is no sign of recurrence of the tumour.

I am showing this case because it seems to give grounds for hope that an inoperable sarcoma may be arrested, if not destroyed, by diathermy. I have long been impressed by the great value of the treatment in the superficial types of carcinoma, but this is the first case of sarcoma of bone in which I have attempted the use of diathermy, and it would be interesting to know whether others have had a similar experience.

Tumour of the Lower Jaw, probably Epithelial Odontome.

By R. DAVIES-COLLEY, C.M.G., M.Ch.

LABOURER, aged 29, first noticed a painless swelling of his left lower jaw in 1914. He served in the Army, but was invalided out on account of his jaw in 1916, when the tumour, which was described as an "osteoma as large as a hen's egg," was excised. In 1919 it began to grow again, and has slowly increased to its present size. There is now a large fleshy mass springing from the left half of the jaw, from the upper part of which a curious shelf-like process projects into the mouth and interferes with the movements of the tongue. The upper surface of the tumour is ulcerated, but elsewhere it is covered with smooth mucous membrane. When he was first seen two greatly displaced molar teeth were embedded in its outer side, but these have been

extracted. X-rays show great expansion and almost complete absorption of the body of the jaw as far back as the angle.

Postscript.—Sections of this tumour after removal showed it to be an example of osteitis fibrosa.

Involuntary Movements following a Mild Attack of Encephalitis Lethargica, after a Latent Period of Six Months.

By C. P. SYMONDS, M.D.

PATIENT, a male, aged 54, first came under my observation at Guy's Hospital in February, 1921, when he complained of loss of energy and giddiness. He had been under the care of one of the assistant physicians for a fortnight with the same vague complaint. No gross signs of physical disease were discovered. The Wassermann reaction was negative.

He was referred to the Neurological Department on February 25. The following history was then elicited: Blacksmith by trade; had always enjoyed good health until just after Christmas, 1920. On getting up one morning, then, he "saw double," complained of slight headache and was somewhat drowsy. The diplopia passed off after two or three days, but he still felt apathetic and out of sorts and remained away from work for two weeks from commencement of illness. His complaint now (February, 1921) was merely of drowsiness and lack of energy. Occasionally he would suffer with giddiness on getting out of bed in the morning.

On examination, left pupil seen to be slightly larger than right; right pupil reacted somewhat sluggishly to light; both pupils contracted well in accommodation. There was a little fine nystagmus on looking in either direction. Tongue was protruded slightly to left.

His wife stated that his temperament was a good deal changed. He had become irritable, was easily depressed, and no longer had any enthusiasm for work.

Seen again in April, 1921, his condition was much the same with the additional complaint of severe and continuous pain indefinitely localized in left lower limb.

When seen again on January 7, 1922, he stated that he had got along fairly well at work with occasional days off on account of general malaise, until July, 1921. By that time the pain in left lower limb had completely disappeared, but there now commenced gradually the twitching movements of left upper limb now present in fully developed state. They have been associated with pain in the arm radiating up the neck and into the side of the head. He has had insomnia which has now decreased.

The movements cease only during sleep. They consist of clonic spasms affecting mainly pectoralis major, triceps, flexors of wrist, and extensors of wrist and fingers. Latissimus dorsi, biceps and pronator radii teres can also be felt to contract. The contractions are quite irregular in their intensity but fairly regular in rhythm, averaging about twenty-four to the minute. On palpation simultaneous contraction may be observed in antagonistic pairs of muscles—namely, biceps and triceps, and flexors and extensors of wrist.

The right pupil remains sluggish to light; there is a slight degree of nystagmus on lateral deviation of the eyes in either direction, and the tongue is protruded slightly to the left.

Case of Plexiform Neuroma.

By PHILIP TURNER, M.S.

PATIENT, R. C., a girl, aged 14, has been previously shown at a meeting of the Section for the Study of Disease in Children on May 27, 1921.¹ She has a diffuse tumour involving the left external ear, parotid region of the face and occipital region of the scalp. Patient's mother says that the swelling of the external ear has been present since birth, but that during the six months previous to her admission to hospital in May, 1921, it had increased in size, so that it completely obstructed the external auditory meatus, rendering the child deaf on that side unless she retracted and raised the pinna.

Extension of the growth to the parotid and occipital regions has been noticed for the past eighteen months.

The tumour is soft and compressible, but does not fluctuate; it appears to have caused absorption or displacement of the cartilage of the external ear. There is a well-marked constriction between the swelling of the ear and that in the occipital region which extends upwards to the vertex of the skull, but the tumour is continuous from the left parotid region to the occipital region beyond the mid-line, while its vertical extent is from the upper half of the neck to the vertex. Its outline is ill-defined, but several hard nodules can be felt in the mastoid region and near the external occipital protuberance. Recently there has been a remarkable growth of hair in front of the ear.

There is but little pain, though the hard nodules are tender when pressed. The nerves involved appear to be the ascending superficial branches of the cervical plexus.

When seen at the Children's Section meeting in May, 1921, the general opinion expressed was that the tumour was a nævo-lipoma which was undergoing degeneration, though diffuse angioma and diffuse neuro-fibroma were also suggested diagnoses.

In May, 1921, portions of the tumour were removed from behind the ear, in the hope that the obstruction of the external auditory meatus might be removed. This to a certain extent was accomplished, for the patient is now able to hear with the left ear. Though the extent of the tumour has increased but slightly, new tissue nevertheless appears to have been formed in the region of the old operation. The tissue removed was examined histologically by Dr. G. W. Nicholson, who reported that the growth was a plexiform neuroma.

Two Cases of Acholuric Familial Jaundice.

By J. M. H. CAMPBELL, M.D.

(Introduced by J. FAWCETT, M.D.)

THE special points of interest about the two cases of acholuric jaundice shown to-night are: (1) The family history; (2) the improvement in Nellie K., while she was under treatment during pregnancy; (3) the rapid change in the hæmoglobin percentage and in the fragility of the red blood corpuscles after splenectomy in Albert K.

There were four proved cases in the family and five others who were almost

¹ *Proceedings*, 1921, xiv (Sect. Study Dis. Children), p. 97.

certainly affected. Full case details of the two patients who are here to-night and of the other members of the family, have been published in the *Guy's Hospital Reports* (July, 1921).

Nellie K., born 1896. When a baby, was noticed to be yellow, and throughout childhood had "bilious attacks" with vomiting, her colour becoming deeper. When aged 20, admitted to Guy's Hospital under Sir William Hale-White for pain in left side and vomiting. In hospital three times during year without much change. Colour always yellow, becoming deeper on three occasions, when she had attacks of vomiting and pyrexia. During one of these attacks urine contained bile pigment and urobilin, but there was not a complete obstructive jaundice. Spleen much enlarged—at least 6 in. below costal margin. Liver not felt to be enlarged. No ascites. Wassermann reaction negative on two occasions.

Several blood counts done with very similar results: Hæmoglobin, 78 per cent.; red cells, 4,500,000 per cubic millimetre; colour index, 0·8; white cells, 13,000; polymorphonuclear, 76 per cent.; eosinophils, 4 per cent.; basophils, 1 per cent.; lymphocytes, 14 per cent.; hyalines, 5 per cent.; and myelocytes, 1 per cent. Apart from jaundice, anæmia, and the very large spleen, physical condition seemed normal. Married soon after discharge.

Two years later she was readmitted for uterine hæmorrhage. A two months' abortion followed. Her general physical condition was the same, but her anæmia was more marked—hæmoglobin, 56 per cent., and red cells, 3,400,000 per cubic millimetre. The Wassermann reaction was again negative.

In 1920, admitted under Dr. Fawcett. General condition fair, but she complained of pain in side and fainting attacks. Four months pregnant. Skin and conjunctivæ yellow; looked anæmic. Physical examination showed spleen to be much enlarged—apparently same size as in 1916. No other abnormality detected. Mr. Maizels found her blood count showed much more severe anæmia than previously: Hæmoglobin, 38 per cent.; red cells, 1,800,000 per cubic millimetre; and colour index, 1·0; white cells, 10,000; polymorphonuclear, 72 per cent.; large and small lymphocytes, 24 per cent.; eosinophils, 1 per cent.; basophils, 0·5 per cent.; myelocytes, 2·5 per cent. Some anisocytosis, slight poikilocytosis and a few nucleated reds observed.

Mr. Ryffel found her urine contained no bile pigment, but a large amount of urobilin, and that her blood serum contained much urobilin and a trace of bile pigment. Bile present in fæces. Fragility of red cells was much increased. Partial hæmolysis with 0·66 per cent. NaCl, and hæmolysis complete with 0·42 per cent. With a normal control there was slight hæmolysis at 0·45 per cent., and it was complete at 0·36 per cent.

Treated with iron and arsenic, and after a short rest in hospital discharged to out-patient department. Two months later her anæmia was less: Hæmoglobin, 50 per cent.; and red cells, 2,700,000 per cubic millimetre. General condition better, but spleen was of the same size.

Four months later admitted under Mr. Chapple for her confinement. Hæmoglobin had risen to 62 per cent., and red cells to 3,500,000 per cubic millimetre. Fragility of red cells not much changed. Partial hæmolysis with 0·6 per cent. NaCl, complete with 0·45 per cent. Yellow colour less noticeable than at any time she could remember. General condition much better than four months before. Enlargement of uterus had pushed spleen upwards and to the left. This caused a good deal of pain, and was the only symptom of which she complained.

Labour uneventful, and child appeared healthy. In blood taken from

umbilical cord red cells did not show abnormal fragility. Very slight hæmolysis at 0.45 per cent. NaCl, partial hæmolysis at 0.42 per cent., and complete hæmolysis at 0.39 per cent. Evidently the placenta acted as an efficient barrier to the transfer of the agent responsible for the abnormal hæmolysis. During the last six months her general condition has remained good.

Albert K., aged 12, jaundiced at birth. This cleared up after a month, but he had always been slightly yellow, and had been liable to attacks of shivering and vomiting, when his colour became a deeper yellow. Admitted under Dr. Fawcett after one of these attacks. He was of a yellow colour, and appeared slightly built. Spleen palpable about 4 in. below costal margin. Liver not felt to be enlarged. No ascites. Heart was slightly enlarged, and there was a systolic bruit. Urine normal. Serum contained much urobilin and trace of bile pigment. Blood count: Hæmoglobin, 69 per cent.; red cells, 4,800,000 per cubic millimetre; colour index, 0.75. Red cells showed partial hæmolysis with 0.66 per cent. NaCl, and complete hæmolysis with 0.45 per cent.; with normal cells hæmolysis slight with 0.45 per cent., and complete with 0.39 per cent. NaCl. Wassermann reaction negative.

Readmitted in November, 1921, as under treatment at out-patients' he had not improved, and had frequent attacks which would probably have disabled him in later life. Condition not appreciably changed. Spleen enlarged to level of umbilicus. Blood count: Red cells, 4,800,000; hæmoglobin, 50 per cent.; colour index, 0.52; white cells, 16,000. Slight aniso- and poikilo-cytosis. Hæmolysis slight at 0.66 per cent., and complete at 0.42 per cent. NaCl.

November 25: Spleen removed by Sir Alfred Fripp. There were a few adhesions. Spleen 8 in. in length (950 gm.). Cultures from spleen negative.

Recovery from operation uneventful.

The change in the fragility of his red cells and in his hæmoglobin after operation, took place very rapidly, but it is too early to say whether there will be a complete return to the normal.

	Red cells per cubic millimetre	Hæmoglobin per cent.	White cells	Hæmolysis	
				Complete	Partial
November 16 (before operation)	4,800,000	50	16,000	0.42	0.66
December 6 ...	5,100,000	78	17,500	0.42	0.60
January 4 ...	5,000,000	78	18,100	0.42	0.54
(Normal: 0.39 ... 0.45)					

Two Cases of Epithelioma of Wrist.

By J. GAYMER-JONES.

Case I.—Patient, a female, M. C., aged 19. Eleven years' history of lupus on back of left wrist. Repeated treatment by X-rays, scraping, radium and skin-grafting. Ulcer now measures about 2 in. by 1½ in.; granulation tissue base, in which a sloughing tendon can be seen. Edges a little hard but not everted. No enlarged glands. Ulcer surrounded by a thin healed area. Stated to be carcinomatous.

(Shown by permission of Sir Alfred Fripp.)

Case II.—Patient, a male, S. M., aged 22. Fifteen years' history of lupus on back of left wrist. Repeated treatment by radium and X-rays. When seen in August, 1920, carcinoma had developed in the sore. Amputation performed above elbow as epitrochlear gland was enlarged. In January, 1921, patient presented himself with enlarged axillary glands, which were removed, and on

section showed "squamous-celled carcinoma." (Section shown under microscope.) No evidence of recurrence at present time.

The area covered by the lupus carcinoma was larger than that occupied by the original lupus.

(Shown by permission of Mr. Philip Turner.)

Postscript to Case I.—Section of edge of ulcer, taken after case was shown, shows "chronic inflammation."

Hodgkin's Disease in a Young Male, with Long History and Absence of Constitutional Symptoms; Failure of Surgical and X-ray Treatment; Proposed Treatment by Radium.

By W. H. OGILVIE, M.S.

PATIENT, a male, W. T., aged 13, attending Out-patient Department at Guy's Hospital, under Mr. L. Bromley.

History: In July, 1918, boy's mother first noticed small swellings in left side of neck. Taken to another hospital, where the swellings were diagnosed as tuberculous glands, and treated by local and constitutional measures for four months. The swellings continued to increase in size. In December, 1918, admitted into Guy's Hospital, and Mr. Rowlands removed a chain of glands from beneath sternomastoid on left side of the neck. Sections cut from one of the glands showed typical lymphadenoma. Shortly after his discharge the swellings reappeared, and he was transferred to Light Department for X-ray treatment. Continually under treatment from January, 1919, till February, 1920, X-rays being given through 5 oz. lead protection. As swellings continued to increase treatment was discontinued. In November, 1920, as swelling was, after two years, still limited to left side of neck, and as his general health was excellent, he was readmitted for a further attempt at surgical treatment. On November 18, 1920, Mr. Bromley removed an outlying gland for section. This again showed typical lymphadenoma, with more fibrous tissue than in the section taken in 1918. On November 29 Mr. Bromley did a block dissection of the glands on left side of neck, and on January 3, 1921, further glands were removed from the posterior triangle. The swellings reappeared and he again received X-ray treatment from February to April, 1921.

Present condition: Left side of neck shows operation scars. There is a group of enlarged glands in submaxillary region, and one over masseter; also some obstructive lymphatic oedema of left side of face. On right side there is a mass of glands extending from clavicle to mastoid process, mostly behind sternomastoid; also a mass of glands in left axilla. Right axilla and both groins are free. Rounded lower border of liver can be felt $1\frac{1}{2}$ in. below costal margin, and spleen also descends $1\frac{1}{2}$ in. below tenth costal cartilage. Chief complaint is of pain in left axilla. Temperature normal during three weeks' observation. Pulse varies from 64 to 100. Blood: Red cells, 4,890,000; white cells, 11,000; hæmoglobin, 75 per cent.; colour index, 0.7. Blood-pressure, 110 mm. Hg. Nervous system and urine normal.

Clinical Section.

President—Sir WILLIAM HALE-WHITE, K.B.E., M.D.

Addison's Disease, with Severe Anæmia, treated by Suprarenal Grafting.

By A. F. HURST, M.D., W. E. TANNER, M.S., and
A. A. OSMAN.

C. C., AGED 41, motor driver, admitted into Guy's Hospital under the care of Dr. A. F. Hurst in November, 1920, for muscular weakness and pigmentation. There is a family history of consumption, but the patient himself had had no previous illnesses.

During the past year he had suffered from increasing weakness; he was soon exhausted on walking, and recently had begun to vomit after meals. His friends noticed that his skin was gradually becoming darker.

On admission the skin was very pigmented all over the body, and in certain areas, around the nipples and genitals, it was almost black. There were also darker brown patches and many minute black spots. There was pigmentation in the mouth on the lower alveolar margins, where his dentures had pressed. His muscular development was good and there was no wasting. There were no signs of active or healed tuberculosis, although the radiographic appearances of the thorax were suggestive of old phthisis. The systolic blood-pressure was 120 mm. Hg. He complained of some soreness of the mouth and tongue, which was somewhat fissured. All his teeth had been removed some months before on account of severe sepsis. Gastric analysis by the fractional method on two occasions showed complete achlorhydria. The spleen was easily palpable just below the costal margin and appeared to be abnormally hard. The liver was also palpable, being apparently slightly enlarged and hard. The percentage of hæmoglobin was 60, the red cells numbered 5,120,000 per cubic millimetre, and the white cells 4,100. The Wassermann reaction was negative. Treatment with hydrochloric acid by mouth, suprarenal extract in large doses, and injections of 1 in 1,000 adrenalin hydrochloride caused no obvious improvement.

At the end of four months the systolic blood-pressure had fallen to 75 mm. Hg.

On March 25, 1921, a suprarenal gland removed from a man who had just died as the result of an accident was grafted by Mr. J. Joffe into the subcutaneous tissue of the inguinal region. The blood-pressure remained as before. A further graft removed from a fœtus just after death was grafted into the substance of the left testicle by Mr. W. E. Tanner on April 11, 1921. The patient had been getting rapidly more anæmic, and a month after

the second operation the hæmoglobin percentage was 43, the red cell count 2,070,000 per cubic millimetre, the colour index being 1.0. No nucleated red cells were present, but there was slight anisocytosis. The eucocyte count was now 7,400. The hæmoglobin continued to fall until on May 6, 1921, it was 28 per cent. A blood transfusion was performed, and the patient was again given hydrochloric acid and iron by mouth. He began slowly to improve, and one month later the hæmoglobin was 40 per cent. and the red cells 2,100,000 (colour index 1.0). The white cell count was 3,600 and 50 per cent. of the cells were lymphocytes. The systolic blood-pressure had risen to 95 mm. Hg. He was discharged from hospital and returned home to attend to private affairs.

He is now (February, 1922) feeling very much better. He has not vomited for several months, but the pigmentation appears to be unaltered. The systolic blood-pressure has risen to 115 mm. Hg. The hæmoglobin percentage is 80. The spleen is still palpable. The suprarenal graft is still palpable, the testicle having partially atrophied.

Rheumatoid Arthritis ; Recovery after being Bedridden for Four and Half Years.

By A. F. HURST, M.D., and A. OSMAN.

H. B., AGED 39, had had attacks of severe multiple arthritis in 1898 and 1907, which had left some deformity in his hands and feet, but he was able to continue at work until 1915, when he had a third attack, starting in the left foot and later spreading to both knees and both hands. The deformity of the hands and legs became extreme. He remained completely bedridden until his admission to Guy's Hospital four and a half years later in June, 1919. On admission there was extreme ulnar deviation of both hands, the fingers, especially of the left hand, were fixed in a flexed position. The knees were drawn up and firmly fixed with great wasting and shortening of the hamstrings. There was no pain, tenderness or pyrexia, the disease having ceased to be active many months before his admission.

On July 4 Mr. W. H. Trethowan performed a tenotomy of the hamstrings of both legs, which were then fixed in plaster in a position of extension. By a further operation three weeks later the feet were fixed in an over-corrected position. The fingers and toes were subjected to gradual extension by means of metal splints fitted with rubber extension bands.

The patient having been unable to move his hands or legs on account of the pain during the active stage of the disease, had lost all power in his muscles when this was passed. This functional paralysis was rapidly overcome by persuasion and re-education.

Five months later he was able to move his fingers without difficulty and the extension apparatus was discarded. Eight months after the tenotomy his legs were perfectly straight, and on discharge in January, 1920, he was able to walk without pain or difficulty and without any semblance of shuffling. He has since returned to work and has remained entirely free from symptoms. There is obvious deformity of both hands, but he can move his fingers well and is able to write. There is no deformity of the legs and no wasting. Both knees look quite normal, and there is full power of flexion and extension. He can walk long distances without undue fatigue and his gait is quite normal.

This case is of interest in showing how a combination of orthopaedic treatment with persuasion and re-education can lead to almost perfect restoration of function, even after a patient has been bedridden from rheumatoid arthritis for as long as four and a half years. We believe that very large numbers of patients in homes for incurables and in infirmaries, who are bedridden and helpless from the effects of so-called "rheumatism," could be restored sufficiently to enable them to live useful and active lives by the application of similar methods.

Case of Subacute Combined Degeneration of the Cord with Achlorhydria.

By A. F. HURST, M.D., and M. E. SHAW, M.B.

T. W., AGED 65, a police pensioner, has never been ill in his life except for one or two attacks of gout. In December, 1920, he had a bad attack of diarrhoea lasting about a week, which cleared up under treatment. Six months later he had another very similar attack and then first noticed sensations of numbness and tingling in hands and feet, which spread up arms and legs. Since then he has found some difficulty in walking, as he is rather inclined to lose his balance. Still gets the sensations in his hands and feet. Has had no trouble with sphincters. Examination reveals nothing abnormal in chest or abdomen. Fairly extensive pyorrhoea. No wasting of muscles; power in limbs good. Knee and ankle-jerks absent and plantar reflex extensor on both sides. Fractional test meal showed complete absence of free hydrochloric acid.

The blood count was as follows: Hæmoglobin, 68 per cent.; red corpuscles, 3,500,000 per cubic millimetre; leucocytes, 9,000 per cubic millimetre. Differential count normal. Film shows no gross abnormality, but the red cells tend to be rather larger than normal.

The duodenal contents removed by an Einhorn tube contained a pure culture of *Streptococcus longus*, which was also found in excess in the faeces.

The case is of interest in showing that complete achlorhydria, which is a constant symptom in Addison's anaemia, may be found in subacute combined degeneration, even in the absence of the characteristic blood picture of the latter disease. The history of diarrhoea suggests that the achlorhydria preceded the development of the cord symptoms, just as it appears to precede the development of the blood changes in Addison's anaemia.

Syphilitic Ulcer of the Tongue in a Child.

By W. E. TANNER, M.S.

A. N., MALE, aged 4, on December 13, 1921, complained of pain in the tongue. The mother found a deep fissured ulcer at tip and thought child had bitten his tongue. There are two younger children both stated to be healthy, last child was born two weeks ago; one miscarriage. Last summer patient had an affection of the eyes for which he attended hospital every day for two months. The father has a positive Wassermann reaction but the

mother refused to have a blood test. The parents have no evidence of active syphilis at the present time. The child is well grown and of healthy appearance with no sign of congenital syphilis except that the head is large and square.

When shown to this Section on January 13 there was a large ulcer which had destroyed the tip of the tongue, spreading on to the frenum. The edges of the ulcer were sharply defined and the base was covered with a slough. The submaxillary glands on both sides of the neck were enlarged. Decayed teeth had been extracted. There were no signs of secondary syphilis. The Wassermann reaction is positive.

The chief point of interest at that time was the diagnosis; the appearance of the ulcer suggested a gumma; the glands did not appear to be so large and hard as are usually seen with a primary sore. The coloured drawing was made on January 17. On January 23 an injection of 0.18 cgr. of sulfarsenol was given intramuscularly into the buttock, and mercury and iodide were given by the mouth. Within a week the ulcer was quite clean with healthy granulations and commencing epithelialization. The glands are small but shotty. Three injections of sulfarsenol have now been given at intervals of a week.

A piece of the ulcer removed for microscopical examination has been reported to be gummatous by three pathologists.

Case illustrating the Advantages of Cholecystectomy over Cholecystostomy.

By R. P. ROWLANDS, M.S., F.R.C.S.

THE patient, a stout man, aged 53, had had an urgent operation elsewhere in August, 1921. A long vertical incision had been made behind the ninth rib cartilage. The operation was said to have been a difficult one. Cholecystostomy was performed and stones removed. The patient was a long time recovering but he ultimately returned to work. He was readmitted into hospital before Christmas for return of symptoms, but these abated and he was sent out without further operation. Soon afterwards he was laid up with fever, ? influenza. He came under my care in January of this year. The present attack started with violent pain in the right hypochondrium and slight jaundice. The gall-bladder could not be felt but there was general rigidity in the right hypochondrium. An operation was advised but the patient would not undergo it unless it was promised that he would not be an invalid afterwards.

Operation (January 16, 1922): Kocher incision. Very dense adhesions found between liver (lower edge) and parietes, and a considerable collection of blood-stained bile above and below right lobe of liver. Adhesions were separated with difficulty. Gall-bladder empty and had perforated on its lower surface. Although the foramen of Winslow was defined, it was impossible to palpate the common bile-duct and decide if there were any stones in it, owing to the great inflammatory œdema of the sub-peritoneal tissues and of the head of the pancreas. A small stone was felt in the cystic duct and this was extracted with difficulty after opening the duct. No more could be felt. The common bile-duct was opened and a large olive-headed probe was passed through it into the duodenum and up into both right and left bile-ducts

without difficulty and without encountering any stones. Although the patient was very ill it was felt he would never remain well unless the gall-bladder was removed. This was therefore done with difficulty owing to adhesions and inflammatory changes around the ducts which made it difficult to define them. When the gall-bladder had been removed another small stone was found in the cystic duct. This was a great surprise. The common bile-duct was drained.

This case shows the advantage of cholecystectomy over cholecystostomy, especially when the disease is limited to the gall-bladder and its ducts, and when the common bile-duct is patent. The former operation is more radical and is far less commonly followed by recurrence of symptoms. With proper selection of cases the removal of the gall-bladder should not have a higher mortality than that of cholecystostomy, which should be reserved for very difficult cases, especially in old and feeble patients. It may be difficult to remove the gall-bladder when it is acutely inflamed, and still more difficult to find and remove small stones in the cystic ducts. If, therefore, the symptoms recur after cholecystostomy, a secondary cholecystectomy is certainly indicated, under more favourable conditions. It should not be forgotten:—

(1) That the infection causing the formation of gall-stones is in the wall of the gall-bladder and that it has been shown to persist there for years after cholecystostomy has been performed for the removal of stones.

(2) That the risk of cancer of the gall-bladder is very considerable and that it can be easily overlooked in its early stages. I have found early carcinoma in five gall-bladders which were removed for cholecystitis and cholelithiasis, there being no previous suspicion of cancer.

(3) That it is an easy matter to overlook a small stone in the cystic duct.

(4) That the presence of ulceration of the duct, subsequently leading to stricture, may cause secondary suppurative of the gall-bladder with rupture and sub-diaphragmatic abscess, as in the case now shown.

(5) That a mucocele or chronic empyema of the gall-bladder may form with secondary pyelophlebitis or portal pyæmia.

These facts, taken together, lead us more and more to compare the gall-bladder with the vermiform appendix and to regard its removal as the only satisfactory treatment of all diseases limited to the gall-bladder and its ducts. It is but a vestigial organ which is not necessary to life and its removal is not followed by any serious consequences.

The chief indications for cholecystectomy are irreparable wounds, injuries or diseases of the gall-bladder and its ducts, in cases in which the bile-duct is healthy and patent. The following are the most important of these diseases: (1) Acute or chronic cholecystitis; (2) gangrene; (3) perforation, with or without cholelithiasis; (4) empyema, hydrops or mucous fistula of the gall-bladder, due to obstruction of the cystic duct by stone, kink or stricture; (5) papilloma or carcinoma of the gall-bladder; (6) volvulus of the gall-bladder; (7) biliary fistula or chronic jaundice, due to kinking of the common bile-duct following cholecystostomy.

It is not wise, particularly for a surgeon without special experience, to undertake this operation in cases in which the patient is very ill, old or feeble, or when the mechanical difficulties of the operation are great. Neither should it be attempted where there is jaundice of some weeks' duration, with consequent risk of hæmorrhage, nor when there is infective cholangitis.

Cholecystectomy should never be performed unless it is certain that the common bile-duct is patent.

Auricular Fibrillation.

By M. A. CASSIDY, M.D.

PATIENT, now aged 34, joined the Metropolitan Police in 1909, and since then had no serious illness. He was seven days on the sick list in 1918, suffering from influenza, and thinks that he resumed duty before his convalescence was complete, but no cardiac irregularity was noticed at the time. In January, 1920, he went sick, complaining of lumbago, and auricular fibrillation was then discovered and its presence proved by the electro-cardiograph. Apart from very slight shortness of breath on hurrying upstairs, there has at no time been any symptom of cardiac failure, and the patient has always maintained that he is unaware that there is anything wrong with his heart. He resumed duty in June, 1920, and has done full police duty since without a day's sickness.

I am showing this case because we are perhaps apt to take too jaundiced a view of auricular fibrillation if we think of it only as seen in the out-patient or consulting room. In Sir Thomas Lewis's monograph on "The Soldier's Heart and Effort Syndrome," it is suggested that fibrillation without signs of cardiac failure, constitutes a 50 per cent. disability. This patient is evidence that this is not always true. I also know of another police officer with auricular fibrillation who remained on ordinary police duty for three years without any but trivial ailments, and who eventually retired on reaching the age limit and he still enjoys good health. I once spent a fishing holiday in Norway with a friend, also a subject of auricular fibrillation, who was able to walk 12 miles or more a day and to climb mountains at least as well as the average untrained Londoner. What would have been the fate of this police officer had he contracted his disability in the Army? I suspect that after a series of Medical Board examinations, his disability would have been assessed progressively from 50 to 100 per cent. He would have been sent to a Heart Clinic and instructed to receive treatment where no treatment is necessary, and to find light work when no light work is to be found; and eventually he would have been converted into a discontented idler, instead of being, as he is at present, a happy and useful member of the community.

Case of Spondylitis Deformans and Osteo-arthritis of both Hip-joints.

By C. MAX PAGE, D.S.O., F.R.C.S.

L. C., AGED 40, contracted an attack of dysentery in Salonica early in 1917. He first noticed pain in the lower part of his spine and both legs in September of that year. The spine became rigid and bent forward towards the end of 1917.

Various forms of treatment directed to allaying his pain were carried out up to the period when the patient came under observation in January, 1920. At that time he was only able to walk slowly with the help of elbow crutches, the spine as a whole being bent forward to nearly a right angle with the lower extremities. There was a general kyphosis of the spine and absolute rigidity in the dorso-lumbar area. The hip-joints both showed fixed flexion of about 40°, further movement forward through 45° was possible but associated with pain.

In January, 1920, an attempt to mobilize the spine and hips was made under full anaesthesia; by the use of considerable force a nearly complete reduction of the deformity both of the spine and hips was effected. The manipulation was followed by some pain but there was no rise of temperature. Subsequently, he was treated by massage and radiant heat baths. On March 18, 1920, movements under anaesthesia were repeated as there was some recurrence of the deformity; on this occasion reduction was found to be only partly possible. Bath treatment, massage and gymnastic exercises, and a visit to Bath followed.

He returned to hospital in December, 1920. The position of the back and hips was then found to be much the same as when he first came under observation except that the range of movement at the hip-joints was further diminished, and pain in the back and hips made walking impossible.

Operative treatment was then undertaken on both hip-joints with a view to making it possible for the spine to come into a straight line with the lower extremities. In March, 1921, an arthroplasty was carried out on the right hip. On May 8, 1921, the left hip was partly excised with a view to producing arthrodesis with the thigh in the fully extended position.

In July, 1921, the patient commenced to walk again with the aid of crutches. The gait was awkward on account of the left leg having been fixed in a position of too great abduction. To remedy this a subtrochanteric osteotomy of the left femur was carried out and the limb fixed in plaster in a straight position. He commenced to walk again in January of this year (1922). The gait is poor as yet, but he is entirely free from pain, and can assume a very nearly erect attitude.

The association of this condition with dysentery is interesting, though it does not conform in its clinical course to those cases which have been classified as dysenteric arthritis.¹ There was no history of gonorrhoea and the Wassermann reaction was negative. The condition of the hip-joints noted at operation was unlike that ordinarily seen in cases of osteoarthritis; but there was a complete destruction of the articular cartilage and only slight lipping at the articular margin; the synovial tissue was replaced by granulation tissue.

This tissue, on microscopic section, was reported to be composed of a mass of vascular fibrous tissue, on the surface of which the structure was that of newly organized granulation tissue. There were a few collections of small round cells lying around blood-vessels. There was some oedema of the fibrous tissue but no evidence of tubercle or other micro-organism. A culture of the joint-membrane was returned as sterile.

The surgical treatment adopted for the case would appear to have been beneficial though it is yet early to form a definite opinion on the subject.

Case of Tumour of the Mandible.

By W. W. WAGSTAFFE, O.B.E., F.R.C.S.

PATIENT, a female, aged 18, barmaid. Admitted to St. Thomas's Hospital under Sir Cuthbert Wallace, January 23, 1922.

Past history: Scarlet fever at end of 1921, i.e., after face began to swell. Swelling left side of face first noticed end of September, 1921; first noticed

¹ "Arthritis in Dysentery," by George Graham, M.D.

outside face, only noticed inside two months later. Gradually increased, but has not become much larger since beginning of December. Practically no pain, except on examination.

Two teeth extracted from left lower jaw in December at an interval of about three weeks. One of these had come through on the inside of the jaw about a fortnight previously. This tooth was loose when first noticed, and the other had been loose about two months before being extracted. The teeth were only removed on account of the looseness, both being quite healthy.

Present state: Four months' history of swelling on left side of face, with practically no pain. Removal of the two teeth without result. Very well-marked swelling over angle and ramus of jaw, left side.

On inspection: Inside the mouth the space between the gum and cheek is filled with a swelling. The mucous membrane is ulcerated in front. The two posterior molar teeth have been removed.

On palpation: There is a firm swelling on the left lower jaw, extending from the angle of the jaw forwards for about 3 in., and up to the zygoma. No tenderness on palpation. Patient is unable to close her jaw, and so cannot chew food on the opposite side. There are no enlarged glands palpable. The swelling does not fluctuate. The gum is swollen, and nearly covers the adjacent tooth. Egg-shell crackling not elicited. Heart and lungs normal.

X-ray: Cystic condition of angle of jaw and on ramus (?) dental cyst.

The case deserves comment from the point of view of: (1) diagnosis; (2) treatment.

(1) *Diagnosis*.—The short history, together with the ulceration inside the mouth, are in favour of a malignant origin of the growth; yet the fact that the growth does not appear to be advancing now is rather against this. The growth is obviously central in the jaw. It is suggested that it is a case of epithelial odontome.

(2) *Treatment*.—Since the tumour has involved the whole of the angle of the jaw, so that there is only a thin shell of bone over it, no local removal of the tumour can be considered. Suggestions as to the type of operation to be performed would be acceptable.

Postscript: Later Progress of the Case.—An operation was performed by Sir Cuthbert Wallace, who exposed the growth by a long incision parallel to the lower border and ascending ramus of the jaw; the growth was found to have completely destroyed the bone at the angle of the jaw. No infiltration of surrounding tissues. Growth extended forwards about $1\frac{1}{2}$ in. from the angle and up to the base of the condyle. The jaw was removed from a point just in front of the growth up to and including the condyle. The buccal mucous membrane was closed and the wound closed. An intrabuccal dental splint was fitted by Mr. McKay to keep the jaw in position. Microscopical examination of the tumour showed it to be a central fibroma of the bone. The wound has healed well and the splint has been perfectly successful.

Clinical Section.

President—Sir WILLIAM HALE-WHITE, K.B.E., M.D.

Case of Posterior Rhizotomy for Gastric Crises.

By CECIL ROWNTREE, F.R.C.S.

PATIENT, J. H., a male, had syphilis in 1898, for which he was treated at a naval hospital. Early in 1919 he began to suffer from attacks of pain after taking food. The attacks of pain increased in severity, and in September, 1919, were accompanied by vomiting. They then became more frequent and their severity became so great that the patient was unable to follow his occupation. Medical treatment had no effect in preventing or controlling the attacks, the frequency of which was seriously affecting the patient's general health, so it was decided to carry out an extensive division of the posterior roots. This was done on May 21, 1921, the fifth to the twelfth roots on each side being dealt with. The crises at once ceased and there has been no return of them up to the present time.

The case is interesting for the reason that the gastric crises were for a long time the only obvious symptoms; the deep reflexes were all present; there were no lightning pains elsewhere, and the sphincter control was not affected. The blood Wassermann reaction was negative, but the reaction of the cerebro-spinal fluid was strongly positive.

The present condition shows complete loss of sensation from the level of the nipples to below the umbilicus and a zone of hyperæsthesia below this. There is also constipation, wasting and general weakness.

This is the first case of the kind in which I have done this operation, and I think the fact that the man was able to go back to work after the operation, having been laid up for a year or so before, is unmistakable evidence of the value of the procedure.

Extensive Lupus of the Upper Air Passages, showing the Benefits of Treatment by the Galvano-cautery and a Low Tracheotomy.

By Sir STCLAIR THOMSON, M.D.

LUPUS started in mouth and palate at age of 11. Treatment with cautery, curetting, lactic acid, tuberculin. Stenosis of larynx necessitated a low tracheotomy in 1916. Since then patient has married and had healthy child. Can skate, dance and play tennis. Larynx and pharynx have remained healed

ever since, but lupus in upper lip required deep treatment with the galvano-cautery under a general anæsthetic on six occasions between January, 1920, and July, 1921.

Case of Erythræmia (Vaquez-Osler Disease).

By J. A. RYLE, M.D.

A. P., MALE, aged 47, was admitted to Guy's Hospital on April 24, 1922, for symptoms suggesting duodenal ulcer. Family history, unimportant. Personal history: At the age of 9 patient had "congestion of the kidneys." At the age of 26, when in South Africa, he had "slow continuous fever." He has spent three years of his life in South Africa and three years in India, but is not aware that he had any tropical infection. He has suffered on and off since the South African campaign from "indigestion" and "heartburn." He noticed no unusual change in his complexion until after his return from India in 1908. His digestive symptoms on admission were characterized by epigastric pain which came on two hours after meals, with some relief upon taking food. Eating meat, smoking, and cold weather aggravated the pain. He has never had hæmatemesis.

The only subjective symptoms referable to his erythræmia are "poor circulation in the extremities" and occasional headaches and dizziness.

Physical features: Apart from the characteristic colour of the face which becomes very much more blue on stooping, there is a remarkable velvety redness of the palatal, faucial and pharyngeal mucosa; there is distension with deep purple coloration of the retinal veins and there is enlargement of the spleen. There is very pronounced varicosity of the veins of the legs. The blood-pressure is 150 systolic and 100 diastolic.

Urine, April 27, 1922: Specific gravity, 1020; good trace of albumin; some red cells, pus cells and a few hyaline casts. Urobilin and bile pigment present but no icterus noticed. May 3, 1922: No bile pigment in urine.

Blood count: Hæmoglobin, 136 per cent.; red cells, 8,800,000; colour index, 0.8. Differential count: Polymorphs, 73 per cent.; lymphocytes, 23 per cent.; eosinophils, 2 per cent.; hyalines, 2 per cent. Platelets, very large. Blood group: Group 2. Fragility of red cells—slight hæmolysis at 0.48 per cent. NaCl; complete hæmolysis at 0.36 per cent. NaCl (normal). Clotting time, 1 minute 55 seconds. Serum, May 2, 1922, shows no bile pigment.

Wassermann reaction, positive.

Stools: Test for occult blood positive, but patient has piles.

Fractional test meal: Normal type of curve with rapid emptying.

X-ray of stomach and duodenum shows no abnormality except for very active peristalsis at pyloric end. The gastric symptoms have all disappeared on ulcer diet, and ol. oliv. and belladonna.

X-ray of thorax shows very definitely increased root-shadows.

The Wassermann reaction and X-ray examination of the chest were performed with a view to deciding whether a diagnosis of Ayerza's syndrome should be considered.

The general features of the case, however, and the absence of respiratory embarrassment would seem to place it in the group usually referred to as primary erythræmia, polycythæmia vera, or Vaquez-Osler disease.

Case of von Recklinghausen's Disease associated with Secondary Anæmia.

By J. A. RYLE, M.D.

F. N., MALE, aged about 60, was admitted to Guy's Hospital in 1919 for a severe secondary anæmia, from which he made a good recovery after removal of septic teeth. Ever since he can remember he has had multiple cutaneous lumps scattered all over his body, and these continue to appear from time to time. They cause him scarcely any inconvenience though they may be slightly painful when they first appear.

His father had an exactly similar condition but he does not know of any other cases in the family.

The lumps, which are characteristic of von Recklinghausen's disease, are scattered over the whole of the trunk, but the best examples are on the back. They vary in size from that of a pea to that of a hazel nut. Some are pedunculated and hang by small stalks from the skin; others appear to be subcutaneous and are better appreciated by palpation than by inspection. Many of these are of a faintly bluish colour and all are small, whereas the larger and pedunculated tumours are of the ordinary pink colour of the integument. Patches of brownish pigment are also present. These are said always to accompany cases of multiple neurofibromatosis.

Case of Elephantiasis exhibited Eleven Months after Treatment by Kondoleon's Operation.

By W. G. SPENCER, M.S.

A MARRIED woman, now aged 29, has suffered since the age of 14 from a gradual enlargement of the left leg. One year before the operation, when she was four months' pregnant with her second child, there was some oozing of fluid from the limb and an acute attack of inflammation preceded by a rigor. A second attack, after the birth of the child, necessitated her keeping her bed for three months. The limb ached after standing or walking for a short period. She was admitted to Westminster Hospital suffering from a mild attack of pleurisy and pneumonia which did not appear to be connected with the enlargement of the limb. There was then no oozing, as she had been in bed for several weeks, also there was no enlargement of the inguinal glands nor was anything abnormal detected in the abdomen or elsewhere.

In June, 1921, an elliptical strip was taken from the outer side of the limb including skin subcutaneous tissue and aponeuroses, in length extending from behind the external condyle of the femur to the front of the external malleolus; the greatest width of the ellipse was 3 in. at the skin, but by means of undermining the greatest width of subcutaneous tissue removed was 5 in. The subcutaneous tissue was at least 1 in. in thickness throughout and consisted of a dense network of œdematous fibrous tissue enclosing isolated lobules of fat. There was a free oozing of lymph but not much bleeding, which was readily controlled by a few fine ligatures, and the wound was united by interrupted suture. Healing occurred by first intention. There was some oozing of lymph for two days so that the skin on either side of the line of sutures became flaccid, and there was much less tension at the first dressing.

A second operation was done eleven days after the first, when an elliptical strip was removed from the inner aspect of the leg. It was noticed that there had been some diminution in tension. Also at the second operation a third strip was taken from the outer and posterior side of the thigh, reaching from the gluteal fold to the back of the popliteal space. These incisions also healed by first intention. The pathological macroscopic examination of the tissue removed showed the histological appearance characteristic of elephantiasis.

MEASUREMENTS OF THE CIRCUMFERENCE OF THE LOWER LIMBS IN INCHES.

	June, 1921			May, 1922	
	Right	Left (before operation)	Left (after operation)	Right	Left
Foot, mid-tarsal joint ...	7 $\frac{1}{2}$	9 $\frac{1}{2}$	9	8 $\frac{1}{2}$	10 $\frac{1}{2}$
Ankle, below malleoli ...	9 $\frac{1}{2}$	10 $\frac{1}{2}$	9 $\frac{1}{2}$	9 $\frac{1}{2}$	12
Leg, above malleoli ...	7 $\frac{1}{2}$	15 $\frac{1}{2}$	10 $\frac{1}{2}$	8 $\frac{1}{2}$	13 $\frac{1}{2}$
Leg, middle ...	9	18 $\frac{1}{2}$	12	12 $\frac{1}{2}$	16 $\frac{1}{2}$
Leg, tubercle of tibia ...	9 $\frac{1}{2}$	13 $\frac{1}{2}$	13	12	15
Patella, upper border ...	11	18 $\frac{1}{2}$	14	13	16 $\frac{1}{2}$
Thigh, middle ...	15 $\frac{1}{2}$	18 $\frac{1}{2}$	16 $\frac{1}{2}$	18	21 $\frac{1}{2}$
Gluteal fold ...	17	19	19	19	22

The patient has been readmitted complaining of recurring attacks of inflammation in the left limb. The accompanying table shows that as regards the left leg there has been a relapse but it is less by 1 to 2 in. than before the operation; the left thigh, on the other hand, is greater in circumference than before. What is especially to be noted is that the circumference of the right limb has increased.

The following is the title of a case published in the *Clinical Society's Transactions*: "Congenital Diffuse Lymphangioma terminating in Lymphosarcoma after Lymphangitis, with a Continuous Hectic Fever for Three Months affecting the Lower Extremity of a Girl, aged 4." By Walter G. Spencer, M.S. Read May 9, 1902. *Trans. Clin. Soc. Lond.*, 1902, xxxv, p. 133.

Case of Recurring Thyroiditis without other Disturbances.

By E. ROCK CARLING, F.R.C.S.

V. W., GIRL, aged 7, was admitted to hospital in July, 1921, with a much enlarged thyroid in which there were four specially hard masses. No other abnormality was detected, and the swelling of the gland subsided spontaneously. In October, 1921, February, 1922, and May, 1922, she was readmitted to hospital, on each occasion with a similar condition as above described. Her weight in July, 1921, was 2 st. 13 lb.; in May, 1922, 3 st. 5 lb. As on the previous occasions the present swelling of the thyroid gland is now subsiding rapidly.

Case of Tumour of Femur for Diagnosis.

By H. TYRRELL GRAY, M.Ch., and B. SANGSTER SIMMONDS, M.B.

PATIENT, E. E., male, aged 57. Gardener by occupation. Admitted to West London Hospital, April 25, 1922, complaining of pain in left knee, hip and thigh, with a swelling over anterior region of left hip-joint; he was unable to

move left thigh, which is abducted and everted. First noticed the pain in left knee three months ago, and at the same time noticed the swelling which was not as large then as it is now.

Blood count: Red blood corpuscles, 4,200,000; white blood corpuscles, 11,000. Blood films: Polymorphonuclear neutrophils, 56·5 per cent.; eosinophils, 5·5 per cent.; basophils, 0·5 per cent.; hyaline, 2 per cent.; lymphocytes, 35·5 per cent.

Wassermann reaction: Negative.

Investigation: Left hip-joint fixed by bony ankylosis in abduction, external rotation and flexion. Bony swelling felt along upper third of femur and another in left iliac fossa.

X-rays: Loss of detail in hip-joint, with new bone formation extending from joint down surface of shaft of femur.

Radiograms of Case of Sarcoma of Femur.

By H. TYRRELL GRAY, M.Ch., and B. SANGSTER SIMMONDS, M.B.

PATIENT, R. Y., a boy, aged 7. Admitted to West London Hospital, April 28, 1922, complaining of pain in right thigh, worse at night, of continuous nature, dull and aching in character and of three months' duration; limps on walking.

Blood count: Red blood corpuscles, 5,350,000; white blood corpuscles, 15,000; polymorphonuclear neutrophils, 72 per cent.; eosinophils, 1 per cent.; lymphocytes, 27 per cent.

Wassermann reaction: Negative.

Operation, May 10, 1922: Resection of sarcoma of femur; fibula graft.

Investigation shows fusiform swelling of shaft of right femur in its middle, very tender on pressure.

X-ray examination shows absorption of about 1 in. of middle of shaft of femur, this area being surrounded by a fusiform sheath of compact bone, interrupted at one spot.

Case of Enlarged Liver.

By J. WALTER CARR, M.D.

PATIENT, a boy, aged 12, had good health until about seven months ago when he began to suffer from attacks of pain in the epigastrium (not related to food), with nausea and occasional vomiting. Two or three months ago a swelling was first noticed in the upper part of his abdomen. However, he continued to go to school until two or three days before his admission to the Royal Free Hospital on March 27. His appetite has been very large. He has never been abroad. The swelling in the abdomen is due to a greatly enlarged liver, which reaches from the fifth rib above nearly to the umbilicus. The edge is sharp, the surface smooth and not tender. There is no ascites and there has never been any jaundice. When the boy was first seen his spleen was distinctly palpable below the costal margin, but it has diminished in size and can now only just be felt. There is no enlargement of the external lymphatic glands.

Wassermann reaction of blood negative.

*

The chief feature of the blood examination is a definite leucopenia. March 31, 1922: Red cells, 5,400,000; white cells, 5,600; hæmoglobin, 90 per cent. April 19: Red cells, 5,300,000; white cells, 3,400; hæmoglobin, 80 per cent. May 3: Red cells, 6,600,000; white cells, 5,100; hæmoglobin, 90 per cent. Differential count, May 3: Polymorphs, 54·5 per cent.; small lymphocytes, 18·5 per cent.; large lymphocytes, 7 per cent.; large hyaline, 14·5 per cent.; basophils, 1·5 per cent; eosinophils, 4 per cent.

Case of Cirroid Aneurysm of the Foot.

By C. MAX PAGE, D.S.O., M.S.

HISTORY: Patient, a man, aged 25, served in the Army in India and Mesopotamia from 1916 to 1919, when he was invalided out on account of dysentery and varicose veins. During his period of Army Service he noticed nothing wrong with the foot, and in general was able to do full duty. In 1921, after an operation for varicose veins, a small ulcer developed on the inner side of the left ankle. This ulcer has healed and broken down again on several occasions since its first appearance. Towards the end of 1920, he noticed some fullness and redness on the inner side of the left heel; he thinks that this swelling has gradually increased.

Present state: There is a diffuse swelling situated on the inner side of the left heel extending downwards into the sole; the margins of the swelling are ill-defined. The swelling pulsates as a whole and on palpation a buzzing thrill can be felt over the whole swelling. Several large tortuous arterial trunks pass into the swelling from behind the internal malleolus. The skin over the swelling is red, but otherwise normal.

The case is shown on account of the comparative rarity of the condition in this part of the body. The local treatment by ligature and excision of the angiomatic tissue would appear to be a reasonable procedure although the literature on the subject suggests that amputation is a common outcome.

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Section of Dermatology.

President—Dr. H. G. ADAMSON.

Case for Diagnosis.

By ARTHUR WHITFIELD, M.D.

THIS lady was shown by Dr. Little about a year ago.¹ She then had an erythematous condition on the arms and legs, and very much round the neck. There was a maddening irritation, and the tentative diagnosis made was mycosis fungoides, with which, at that date, I did not agree. She later came under my care, and I found that this attack began on a damaged patch on the right leg. I thought if I could get that right, I might cure the whole thing. I painted the patch with 2 per cent. silver nitrate, and from that moment she began to improve, and now I think she is practically cured. I have brought her because in these cases, shown as possible pre-fungoid stages of mycosis fungoides, we often do not get an ultimate history. I do not regard this case as mycosis fungoides; it is what the Americans call infectious eczematoid dermatitis.

With the idea of de-sensitizing her, I gave her several injections of thio-sulphite of soda intravenously. It seems a safe remedy, but it does make the patient feel somewhat ill and very thirsty. The malaise passes off in an hour or two. I do not think that the injections modified the disease; it was the silver nitrate that did it, because when we left it off too soon the eruption began to come back again.

Some Cases of Psoriasis treated by Danysz's Method.

By H. C. SEMON, M.D.

THE first case is a single woman, aged 72. There was a seven years' history of this condition, and the lesions were apparent on the right forearm, left knee and buttocks. She has been under treatment in more than one London hospital, but every effort even to alleviate the condition failed. Psoriasis, we know, is a skin condition which has very few subjective sensations, but this has been so irritating to the patient that it has prevented her sleeping. Since 1916 she has had every kind of treatment, from X-rays to chrysarobin—the latter only when we could feel justified in applying it. Having seen Dr. Barber's two cases which were treated by Danysz's method, I thought this was a suitable case for it, and I asked Dr. Knott to give me some of the same vaccine. She

¹ *Proceedings*, 1921, xiv, p. 21.

has had twelve injections of this in all, and there was no local or constitutional disturbance. From the time of the third injection the whole condition began to clear up. One or two small lesions remain, which even now confirm the diagnosis. The interest lies in the fact that this is the only successful response in seven cases, and that seems to be the general kind of experience; therefore it is for us to find out in which type of cases the Danysz's treatment is likely to be successful. I have another case to show you here to-day, with deeply infiltrated lesions, as opposed to the superficial type of psoriasis which has not responded in my cases, so far. Both the patients are suffering from rheumatic manifestations, and both have very irritable lesions, and it is possible this may be the responsive type. I shall show you a case of psoriasis which, objectively, failed completely, though subjectively there was some improvement. It is that of a man, aged 32, who has had an eruption round the anus for some years. He has three brothers with a similar complaint. He also has psoriasis of the nails, and under observation developed lesions on the penis and head. X-ray exposure has been the only thing which has relieved him.

DISCUSSION.

Dr. BARBER said he had used Danysz's method for psoriasis a good deal, and his experience coincided with Dr. Semon's. He had had some cases in which the method had completely failed, although given a very thorough trial. He was unable to foretell whether the treatment would be successful or not; in some cases it was of distinct value.

Dr. HALDIN DAVIS said that Danysz's treatment seemed to him to be going the way of all previously vaunted specifics for psoriasis. It was their usual experience with each new method that the first cases invariably did well, so much so that a somewhat cynical physician had said, "use your new remedy while it still cures;" but that subsequently the proportion of failures grew larger and larger until the method either passed into the limbo of forgotten remedies or at least was employed only occasionally as a last resort.

Case for Diagnosis.

By H. C. SEMON, M.D.

PATIENT, a young man, aged 19. He came to me first in July, 1920, with impetigo, and the treatment for it was successful. But in January he returned with the same condition—vesicles on both legs. I did not ascertain whether streptococci were present in them, but he was cured by February this year. He came again with a relapse in July, and by August 3 he was once more cured. On August 31 he returned with a different appearance on his legs; definite ulceration with nodular infiltration, suggesting, to some extent, a granuloma. The Wassermann reaction was negative. I think the etiology of the condition may turn out to be tuberculous.

Dr. WHITFIELD, discussing this case for diagnosis, did not regard it as tuberculosis, but as chronic pyoderma. The eruption was very irritable, which was rarely the case with tubercle. Moreover, in healing, tubercle seldom left marked pigmentation, but streptococcal lesions did, if they were chronic. The patient seemed to have had a severe streptococcal infection; he said it began with a football hack. When he got hot and chafed the skin he seemed to set the condition going again.

Band Sclerodermia of Leg in a Young Woman (showing Result of Treatment).

By GEORGE PERNET, M.D.

I SHOWED this patient here in 1919, and I bring her again now so that you may see the results of persevering treatment by massage and ionization. She had extensive band sclerodermia from the buttocks to the ankle and on the foot. It has now, you see, practically all cleared up. She has had massage twice a week since last shown. Also ionization (zinc and chloride of sodium from Mr. MacDougal). I put her on small doses of thyroid from the beginning, but I do not think much of the good result can be attributed to that treatment.

Epithelioma on Lupus Vulgaris in a Man.

By GEORGE PERNET, M.D.

THIS man has an epitheliomatous condition of the face which developed on an old lupus vulgaris lesion. He is 45 years of age, and the lupus has existed from his fifth year. At the age of 25 the lupus was excised and this was followed by grafting. About a year ago, horny growths appeared and they were treated at another hospital for twelve months apparently with acids. In December, 1920, when the lesion was the size of a florin, he was treated by radium, and has since then become much worse. He has only quite recently come under my observation.

DISCUSSION.

Dr. BARBER suggested the employment of diathermy; he had seen good results from this method in cases of rodent ulcer.

Dr. GRAY thought it might be possible to treat the case with arsenic paste, but he considered diathermy would be preferable.

The PRESIDENT said he thought diathermy a treatment which might in future be employed for rodent ulcer and epitheliomata of the skin, especially perhaps for large growths such as in the present case. He understood that it was now used very successfully in Australia, where rodent ulcers and epitheliomata of the face were of very frequent occurrence, but he did not think that in this country dermatologists had given much attention to diathermy, possibly because in the earlier cases which most often came under the care of a dermatologist, there were already other methods which were quite efficacious. Dr. Cumberbatch, who was a pioneer in regard to diathermy in this country and who had written a very instructive book on this subject, had expressed a very hopeful but guarded opinion as to the value of this treatment for rodent ulcer. He thought that if anything could be done for Dr. Pernet's case the choice lay between diathermy and the arsenic paste method of which Dr. Gray had lately shown some successful results.

Dr. PERNET (in reply) said he had not thought the application of arsenic paste was adapted to such lesions as these. Another method was surgery "plus" fulguration (as carried out by Dr. Keating-Hart, of Marseilles).

Case for Diagnosis.

By A. M. H. GRAY, C.B.E., M.D.

THE patient, a male, aged 35, has had recurrent attacks of stomatitis for the last three years. They begin with what looks like an aphthous ulcer, which in a week spreads over the mucous membrane, sometimes involving the pharynx. Each attack takes two or three weeks to subside and then recurs again in another two or three weeks. Many bacteriological examinations of the mouth have been made by Dr. McNee, under whose care the patient is, and the results have been uniform; the only two organisms found in any quantity have been *Streptococcus pyogenes longus* and a rod-shaped organism, both normal inhabitants of the mouth. The Wassermann reaction is negative and the blood count normal. He has had much local and also internal treatment without any effect. In November, 1920, at the height of an attack, he was given 0.3 grm. of novarsenobillon, after which the attack subsided; a month passed without his having another. In January, 1921, he came up just as an attack was commencing and had another dose of 0.3 grm. This aborted the attack, and he has had no further one till the present attack, which commenced a few days ago, this being an interval of ten months.

Another case has recently come under the notice of Dr. McNee and myself; it is almost identical in character and it has improved under N.A.B.

DISCUSSION.

Dr. WILFRID FOX said he had a case resembling this which he looked upon as ordinary septic stomatitis, the starting point of which was probably pyorrhoea; the patient had reacted favourably to collosol manganese.

Mr. H. C. SAMUEL asked whether it might not be erythema iris confined to mucous membrane.

Plasma-cell Tumour of Lip, with Photograph and Sections.

By W. J. O'DONOVAN, M.D.

THE patient is a woman, aged 52, who has had a sore at the corner of her mouth for two and a half years. In 1919, she was in London Hospital with a history of hæmatemesis, but as there were no physical signs she was discharged in a week. Recently she attended the Skin Clinic complaining of this sore, $1\frac{1}{2}$ cm. in diameter. I thought it was a rodent ulcer, and it was excised, but microscopically it is found to be almost a solid collection of plasma cells. If the Wassermann reaction had not been negative one might have regarded it as a late syphilide.

Dr. WHITFIELD regarded the tumour as an endothelioma, and said that it was quite right to have had it removed. Many years ago he had had a case of small growth on the inside of the ala nasi; the patient was shown at the West London Hospital, and the case diagnosed by someone there as lupus. His own view had been that it was rodent ulcer. Dr. Ball, under whose care the case was, excised the growth and sent Dr. Whitfield the tissue to cut. It looked exactly like this present section. Sir Lenthal Cheate also considered it was endothelioma. Mr. Shattock agreed with the diagnosis, but he did not draw such a sharp line between connective tissue tumours and infective granulomata as others did. He (Dr. Whitfield) thought this was an endothelioma made of plasma cells, forming a tumour which ulcerated but did not relapse on removal.

Section of Dermatology.

President—Dr. H. G. ADAMSON.

The Rationale of the Wassermann Reaction.

By J. E. R. McDONAGH, F.R.C.S.

(ABSTRACT.)

[This Paper will be published in full in the *British Journal of Dermatology and Syphilis*.]

THE hæmolytic system is the indicator in all complement-fixation tests. Hæmolysis shows that the complement in the first half of the experiment has not been destroyed, whilst absence of hæmolysis shows that it has. Complement is a state and not a substance, that is to say, it represents the normal hydrogen ion concentration which maintains the protein particles in true emulsion. Any manœuvre which changes the normal electrification of the protein particles destroys complement. When we use the fresh serum of a guinea-pig as complement we add not only the state but also normal protein particles in which in other instances the antibody resides. When a serum to be tested is altered by disease or by other causes, it attempts to rectify the damage done at the expense of the added normal protein particles. This damages their normal electrification and destroys the state (complement) which kept them normal. Normal particles are damaged when they come into contact with other particles the negative electricity of which is increased or diminished. In time this leads to agglutination and final precipitation of the particles concerned. During this time a diminution of surface tension occurs, which, if red blood corpuscles are present, causes them to part with some of their hæmoglobin (hæmolysis). If precipitation is complete before the corpuscles are added, the normal surface tension is regained and the corpuscles fall of their own weight to the bottom of the tube (no hæmolysis). The so-called amboceptor in the hæmolytic system can be replaced, either by a simple negatively charged colloid such as silicic acid, or by a simple positively charged colloid such as aluminium hydroxide. The former acts as a condenser and causes condensation of the protein particles in the guinea-pig's serum. This leads to agglomeration and precipitation of the particles which destroys complement and lowers the surface tension. The latter acts as a conductor, and at first increases the negative electricity and the number of the particles. Later agglomeration and precipitation set in with the same results. If both colloids are added there is no hæmolysis, because a state of iso-electricity is produced, which does not upset the complement. Moreover, hæmolysis does not result if the colloid and the guinea-pig's serum are allowed to interact before the red blood corpuscles are added. In early syphilis the serum undergoes much the same changes as are produced by a single intravenous injection into a rabbit of a metallic colloid. Repeated injections lead to dispersion of the protein particles till some of them ultimately pass into true solution. This results in a negative complement-fixation test, and explains why treatment of early syphilis with metals does the same. More than one injection of a non-metallic colloid belonging to the sulphur group causes a rabbit's serum to give a positive complement-fixation test, and changes in the protein particles are produced indistinguishable from those met with in late syphilis. Non-metals produce condensation of the protein particles. The condensation produced by a disease like syphilis may make condensers when they are introduced behave as conductors, hence the reason why intramine is more likely to make a late positive syphilitic serum give a negative complement-fixation test than arseno-benzene. Condensation imparts extraordinary stability

to the particles, and this explains why most syphilitic sera ultimately become positive and remain so irrespective of treatment. Condensation of albumin particles imparts to them the properties of globulin, therefore globulin particles are those which have had to conserve their electrons. Hence the avidity shown for normal particles as are contained in a guinea-pig's serum and for the negatively charged gold particles in Lange's gold-sol test. Most, if not all, physical changes are cyclical, and globulin, after becoming lipoid-globulin, may be re-converted into albumin. Excess of albumin nullifies a positive complement-fixation test, just as it protects colloidal gold from being precipitated. This is sometimes the reason why a late syphilitic serum gives a negative complement-fixation test, and it explains why intramine in such cases is a better *provocateur* of a positive reaction than arseno-benzene. Anti-complementary reactions are produced when the damage to the surface of the protein particles reaches as far as the mass. Particles so damaged may form good antigens in the Wassermann reaction. Condensation of the protein particles occurs also in pregnancy, and this explains why at least 10 per cent. of non-syphilitic pregnant women give a positive complement-fixation test, and many syphilitic pregnant women a negative reaction. The Sachs-Georgi reaction is identical with the first half of the Wassermann reaction. The agglutination and precipitation of the protein particles are rendered visible to the naked eye by using greater strengths of the ingredients and allowing them more time to interact, as a positive complement-fixation test can be produced in a normal subject by the continued use of a non-metallic preparation, such as the carbon di-sulphide product of di-ethyl-amine. As in early syphilis, non-metals change a positive complement-fixation test to negative, which may be rendered positive again by non-metals. As in late syphilis, non-metals are more active in producing a negative complement-fixation test than metals. As the complement-fixation test is, in short, an exhibition *in vitro* of a battle *in vivo* of condensation versus dispersion, it seems reasonable to infer that the test in syphilis is valueless as a guide to a cure and as a regulator of treatment.

Case for Diagnosis.

By J. H. SEQUEIRA, M.D.

PATIENT, a male, aged 40, was living for a long time in British Columbia, and he has suffered from an eruption on the face and groin for a long time. The first lesion appeared in September, 1919, on the right eyelid; a little later one appeared on the left eyelid, and then some on the lips and in the groin. Histologically—and, I think, clinically too—the lesion is a granuloma. Some suppuration has been present in the lesions, which are now much less severe than they were six months ago. I had him under my care in hospital for a considerable time; there was a high temperature and he was very ill with anæmia, just as if septic absorption was present. The case was very thoroughly investigated, and sections of the growths were taken, but the Wassermann and other tests were negative. Novarsenobillon administered intravenously produced no change; antimony was also given by the vein without benefit. The only drug remedy which has affected the lesions has been iodide of potassium, pushed to toleration point; but he is very sensitive to this drug, and when the dosage reaches 45 gr. a day he has symptoms which require its intermission. We have searched for fungi, for blastomyces, sporothrix and other organisms, especially tronical organisms, which are known to cause granulomata, and he

[November 17, 1921.]

has been seen by Dr. G. C. Low, who failed to find any lesion associated with a tropical organism. I think the eyelid and lip lesions more closely resemble blastomycetic dermatitis, but the flat lesions in the groin remind one of granuloma tropicum.

Dr. GRAHAM LITTLE said he believed the climatic distribution of blastomyces was very limited, and the Western Pacific Slope of America was said to be a place where it did not exist. An instance of that came under his notice when he was in Chicago with Dr. Ormsby, who mentioned that he had a lady patient suffering from blastomycosis. A body of Christian scientists took possession of her and sent her to San Francisco. While staying there she lost her blastomycosis, and the cure was attributed to the influence of the Christian Science treatment. But on her return to Chicago later on she came back to Dr. Ormsby with a recurrence of the same disease, and Dr. Ormsby ascribed the improvement which had taken place while she was resident in San Francisco to the climatic condition, which did not favour the growth of blastomyces.

Case for Diagnosis.

By J. H. STOWERS, M.D.

PATIENT, a female, aged 41, single and of marked neurotic temperament, states that for twelve years she has suffered extensive multiple lesions involving the anterior part of each leg. For nine years she has been a teacher in a County Council school. She lives at home with her father (her mother having died of heart disease after a long illness) and has been subject to financial strain. Eleven years ago she underwent an operation for appendicitis and two years later a second operation for the removal of adhesions. Subsequently, she has been under treatment for mastoid disease. The lesions which are roughly symmetrical and of variable size involve nearly the same area on each leg but are more numerous on the left. The configurations are remarkable owing to their angular shape, the skin being inflamed, thickened and in parts desquamating. Aching pains are complained of which disturb sleep at night. The diagnosis appears to be between trauma, scleroderma, atrophic lichen planus, lupus erythematosus or tuberculide, but in spite of the difficulty of diagnosis I am inclined to the opinion that the case is one of dermatitis artefacta.

Case for Diagnosis.

By H. MACCORMAC, C.B.E., M.D.

PATIENT, a female, aged 53, presents a condition which resembles in many ways that found in the case shown by Dr. Stowers. Apart from an indefinite family history of tuberculosis and a personal history of epilepsy there is nothing of importance to be obtained from her statements. The eruption commenced on the right leg twenty years ago as a small area similar to those seen on the left leg. Other similar areas appeared and coalesced to form the large plaque now present. This lesion, a pigmented scar, is slightly scaly, atrophic, pigmented, and finely grained by numerous small blood-vessels. The smaller lesions are of the nature of superficial pigmented scars. Recently a small deep lesion has appeared in the right thigh which conveys to the palpating finger the impression of a hypodermic nodule. If the plaque were seen on the scalp it would probably be diagnosed as lupus erythematosus, and possibly we have here a condition intermediate between lupus erythematosus and Bazin's disease, a suggestion of which is conveyed by the lesion in the thigh. The Wassermann reaction is negative.

DISCUSSION.

Dr. J. J. PRINGLE, discussing Dr. MacCormac's case, said he would not venture on a firm diagnosis of such a condition. It was open to many opinions, but he recalled one case of identical nature, which was shown at the Dermatological Society of London by Dr. Cavafy about twenty-five years ago. The lesion in that case was a single oval lesion on the thigh, extending nearly a foot in its long diameter. At first it was considered to be an erythematous lupus, but a few weeks afterwards a process of atrophy had occurred; in fact, it became a large pale atrophic scar of almost cigarette paper appearance. He thought Dr. MacCormac's remark very pertinent, that if such a lesion as that shown with its satellites were seen on the scalp, it would be regarded, without hesitation, as erythematous lupus. He did not think the case an artefact, as it had been so carefully watched in hospital.

The PRESIDENT thought that in both these cases the rectangular shape of the lesions and their unnatural and awkward arrangement pointed to their artificial production, and he regarded them both as examples of dermatitis artefacta. These features seemed to him to exclude lupus erythematous and Schamberg's disease, which were alternative diagnoses which had occurred to him.

Sir JAMES GALLOWAY asked whether it was usual to find, in artefact lesions, such a beautifully fine scar as that in Dr. Stowers' case. Had it not been for the scar being so fine and beautifully formed, and the atrophy so perfect, he would have been inclined to agree with the artefact idea, especially on account of the distribution. Concerning Dr. MacCormac's case, he did not see any reason why lupus erythematous should not be limited to the extremity. But this patient was an epileptic, and had been treated for a long time with bromide. He thought that probably bromide had something to do with the causation in Dr. MacCormac's case.

Dr. F. GARDINER (Edinburgh) said the first feature he noted in Dr. MacCormac's case was the pigmentation; it looked like the scars after bromide eruption. A number of these cases had been seen in Edinburgh recently, and he noticed not only the deep scarring, but also the weakness of skin left in many parts. With regard to artefact, he did not find in either of these patients evidence of anaesthesia of palate or conjunctiva, but he certainly thought Dr. Stowers' case was one of artefact, because of the base, of the slight superficial scarring, with the small stipules, and glazing.

Dr. WILFRID FOX, referring to the intensity of the scarring, recalled a case he had had in conjunction with the late Mr. Clinton Dent, which was shown before the Dermatological Society of London. In that case the patient, a woman, had one patch on the left knee and one on the chest, in both of which the scarring was more dense than in either of these cases; it was more of the consistency of parchment, and coagulated blood could be seen in the vessels over it. It was proved to be a case of dermatitis artefacta, caused by rubbing in oxalic acid.

Dr. STOWERS (in reply) considered that the chances that his case was one of artefact were considerable, but he did not think Dr. MacCormac's case was of the same nature. The distribution was different, and the upper part of one thigh was involved; the lesions were more circinate and corresponded more with the lesions of an atrophic lichen planus, there being no angular edges visible.

Dr. MACCORMAC (in reply) said the question of the lesions being due to bromide was considered as soon as the case was first seen and it was known she had been taking bromide. Inquiry showed there had been no nodular eruption, hence he did not think bromide was answerable.

Epithelioma of Cheek.

By H. MACCORMAC, C.B.E., M.D.

PATIENT, a male, aged 42, first noticed a "lump" in the left cheek, in front of the ear, four months ago, which gradually increased, assuming its present size—about the dimensions of a shilling. The centre shows a tendency to

break down and become ulcerated and crusted. There is no marked induration and no lymphatic gland enlargement can be detected. A small piece was taken from the periphery for sections, which proved the growth to be a squamous-cell carcinoma. This type is unusual in this situation and does not commonly occur primarily on the skin. Excision is the method of treatment suggested.

Case of Tuberculosis of the Skin following a Cat Bite.

By HALDIN DAVIS, M.B.

PATIENT, a male, who was bitten on the back of the hand by a cat nine or ten months ago. The wound never healed properly and in the scar there gradually developed the present lesion, which is red and exhibits a few points of suppuration. On the palmar aspect of the thenar eminence are four little apple-jelly nodules marking the imprint of the animal's teeth. The clinical diagnosis has been confirmed by a microscopical examination of a piece of the lesion. Tuberculosis in cats is somewhat rare but Petit has found in doing a number of autopsies of stray cats that about 2 per cent. of them were tuberculous. The disease in these animals affects the intestinal tract far more often than the lungs, hence the danger of infection from a bite. Another point which adds to the danger of infection is that tuberculous lesions in cats are usually much richer in tubercle bacilli than the corresponding lesion in human subjects. A few years ago Sir Arnold Lawson published three cases in which children had contracted fur infections from cats, one of which was tuberculous.¹

DISCUSSION.

Sir JAMES GALLOWAY asked what was the best way of dealing with local infections, such as were often received to the hands in doing post-mortem work. He once had such an infection which persisted for eighteen months; on account of the mildness of the lesion he thought it could not have been his first infection with the disease. Dr. Parkes Weber had a similar lesion, but it lasted longer, and therefore might have been his first infection. He (Sir James) had used the President's method, the application of acid nitrate of mercury, and in certain cases it was valuable; but perhaps Dr. Adamson did not fully appreciate the pain and discomfort it caused. He cured his own case with salicylic acid.

Dr. J. H. SEQUEIRA said he had seen a number of cases of tuberculosis verrucosa, due to local inoculation of the tubercle bacillus, and he had found the majority of them did well with a plaster of 33 per cent. each creosote and salicylic acid. This was kept on forty-eight hours to produce a reaction, and often there was great advantage in a short X-ray exposure, following this by another application of plaster. For a small lesion the best method was excision, and the nearest glands should be carefully examined. In several instances he had had the glands removed, because they were already involved when he first saw the cases.

Dr. GARDINER said acid nitrate of mercury caused great pain, but the results he had found very satisfactory. He acquired a tubercular infection of the knuckle with post-mortem work, and neglected it for six weeks, but it got well with simple scraping and the application of chromic acid, followed by a dose of X-rays.

Dr. F. PARKES WEBER said that in his own case the inoculation lesion which Sir James Galloway had referred to, was a localized nodule in the deepest layer of the cutis, from a minute punctured wound. The lesion was excised, and at that time no one would have suggested any other method of treatment.

¹ *Proceedings*, 1917, x (Sect. Ophth.), p. 29.

The PRESIDENT said that in his experience these cases of lupus verrucosus of the extremities did well with any form of selective caustic treatment. He had been accustomed to employ a paste containing salicylic acid, resorcin and pyrogallic acid, which was applied until the lesion was well ulcerated, and then followed by a pastille dose of X-rays.

Dr. KENNETH WILLIS asked whether members of the Section had lost faith in X-rays as a method of treating skin tuberculosis. Too many doses were required in lupus vulgaris, but he had had good results from X-rays in other tuberculous lesions.

Dr. HALDIN DAVIS replied that he considered excision the best form of treatment when the situation permitted of it. The present lesion was too large to excise without subsequent skin-grafting. He had intended painting it with liquid acid nitrate of mercury. He had had a case of tuberculosis of the nose, inside and out, in a woman, which cleared up entirely under this treatment, combined with some pyrogallic acid ointment to put in the nose afterwards. She had had a good deal of pain in the first few days, but he found patients did not mind that much if they did well.

Case for Diagnosis.

By E. G. GRAHAM LITTLE, M.D.

PATIENT, a middle-aged man. I am doubtful about the nature of his rash; he has a follicular keratosis, which has developed in the last few weeks on the backs of his arms and the back of the trunk, the dorsum of the hands and the back of the proximal phalanges. In the absence of a history, I should have diagnosed pityriasis rubra pilaris; but he has been under my care continuously for two years with a very definite but somewhat scanty dermatitis herpetiformis, for which I had given him arsenic, and by this means I have controlled the eruption. While he has been taking this the keratosis appeared, and I am not sure whether it is a manifestation of arsenical intoxication or a coincident development of pityriasis rubra pilaris. There are no other symptoms of arsenical poisoning. The leucoderma present on the body preceded the other conditions. I am not familiar with any arsenical eruption quite like the one here present.

Dr. J. J. PRINGLE said that were it not for the man having taken a considerable amount of arsenic, he did not think anyone would question the diagnosis of pityriasis rubra pilaris; the lesions were typical of that disease in a comparatively early stage, and there was an absence of all other evidences of arsenical intoxication. He was not familiar with a result of arsenic similar to this. A very important point was that dermatitis herpetiformis was evidently one of the types which were subjugated by arsenic. There were certain types of dermatitis herpetiformis which one could recognize, after some experience, as being amenable to arsenical treatment, a fact more widely recognized in France than here—Brocq and Darier often alluded to the subject. He could not be certain, but he thought this patient might have the two co-existent diseases—dermatitis herpetiformis, now apparently in abeyance, and pityriasis rubra pilaris.

Case of Guttate Sclerodermia.

By J. H. SEQUEIRA, M.D.

PATIENT, a female, aged 37. She has always enjoyed good health. She has had six children and never had miscarriages. Nine months ago, she says, an eruption suddenly appeared on her neck, and there is now a necklace-like eruption of white, somewhat atrophic, spots. There has been no adenitis or irritation. The Wassermann is negative. The case is one of guttate sclerodermia of the neck, and recently the left mammary region has become affected.

Section of Dermatology.

President—Dr. H. G. ADAMSON.

Case for Diagnosis.

By H. G. ADAMSON, M.D. (President).

I AM showing this case, which I saw for the first time yesterday, to ask for suggestions as to diagnosis before the lesions become altered by treatment. The patient, Miss J., aged 37, a cashier, is suffering from ulcerations of the legs of about six months' duration. The lesions consist of sharply circumscribed patches, slightly raised and only superficially infiltrated and with their surfaces riddled with punched-out holes about $\frac{1}{8}$ in. in diameter, the holes in some parts running together to form superficial ulcers of about $\frac{1}{2}$ in. in diameter. On the right leg there are six patches, on the left leg three, which vary in size from 1 to 3 in. in diameter; one patch (crescentic shaped from partial healing) is about 5 in. long. There are also a few very small patches which seem to indicate the manner of origin of the lesions. The earliest lesion is a small soft flat papule with a central crust, beneath which is a small punched-out hole. The next stage is represented by a patch about $\frac{1}{4}$ in. in diameter on which are four or five punched-out holes, and the latest stage is that of the larger patches already described, on which there are many punched-out holes, some of them blending to form larger ulcers; the punched-out holes are filled with a clear or turbid serum, the larger ulcers with a yellow slough.

I am unable to make a diagnosis: syphilis and tubercle seem to me excluded by the fact that the lesions do not begin as a deep-seated granuloma; streptococcal infection by the absence of the characteristic phlyctenular lesions; staphylococcal infection and ringworm by the fact that the lesions are not primarily perifollicular. I do not think the lesions are artificially produced. Dr. Gordon, under whose care the patient has been, has had cultural examinations and a blood test made with negative results. I think the lesions are the result of some unusual infection and further investigations will be made.

DISCUSSION.

Dr. WILFRID FOX regarded the lesions as chronic septic infection. The granulomata and artefact he thought could be ruled out. Such cases seemed to do well on peroxide fomentation.

Dr. GRAHAM LITTLE referred to a similar case of his own which had caused him much trouble. The man was in a military hospital, before he attended St. Mary's, for three years with an intractable ecthymatous infection of the legs, healing over to form a very thin scar. What had cured him, for the time at any rate, was an autogenous vaccine, made first from the streptococcus derived from the lesion, and then from a staphylococcus subsequently found. With very little other treatment the man had done exceedingly well. He suggested a like procedure in this case.

Dr. MACLEOD agreed that the case was probably one of a mixed infection, and the suggestion about an autogenous vaccine was good. During the War he saw a certain number of superficial ulcerated conditions, more ecthymatous than in this case, and he treated them in a routine way with ultra-violet rays, half-hour exposures, which might be worth trying in this case.

Dr. A. M. H. GRAY did not feel certain that this was a simple streptococcal infection. Probably many ecthyma lesions were primarily streptococcal in origin, but in ecthyma, he thought, there was a second factor present, namely, trauma. The linear ecthyma cases seen during the War were primarily traumatic, and the infection was secondary. In the present case there was no evidence of trauma, but there was extensive scarring, and he would have thought there was some underlying condition of a granulomatous nature, the most likely of which seemed to be tuberculosis.

The PRESIDENT (in reply) said he could not accept the idea that this case was streptococcal, for in such cases the essential feature was a phlyctenule, which might afterwards become an ecthymatous ulcer, and the early lesions in this case were not phlyctenular. He thought it was some other infection, and not of a simple nature.

Case of Dermatitis Herpetiformis.

By E. G. GRAHAM LITTLE, M.D.

THIS lady has been suffering during the last twelve to eighteen months from a very intractable dermatitis herpetiformis, and she was in a very distressing condition two or three months ago. There was no appreciable control by arsenic. Dr. John Matthews and other colleagues investigated her case for possible foci of toxic absorption, and Dr. Matthews isolated an organism from her faeces—the Morgan bacillus. We then stopped the arsenic, and gave her doses of a vaccine made from her organisms of this class. The first dose was followed by a very severe reaction, although only 2 million of the bacilli were given, therefore we had to stop it, and after an interval resumed it very tentatively. After this, the dosage having been increased by very small amounts, she has undergone remarkable improvement. She has now been out of bed a fortnight, and the condition shows a slight relapse; the treatment is being carried out under disadvantages, as she has to do her work at the same time. This vaccine is a valuable additional means of treatment of a disease very difficult to control. She has now had a good many injections and can tolerate doses of 20 million.

Case of Cheilitis.

By E. G. GRAHAM LITTLE, M.D.

THIS young woman has been under my care on account of very severe rosacea, which is better for the moment. The peculiar condition of the lip which you see has been present for a much longer time than the rosacea. There is a definite atrophic line passing round the whole of the lower lip, and on the upper lip, over the vermilion border, there is much white striation. The only subjective symptom is extreme dryness, which requires the lips to be constantly wetted. She has a very seborrhœic face, and the rosacea is a concomitant symptom. Whether [the cheilitis is a seborrhœic condition is a question for consideration.

A Resistant Case of Secondary Syphilis.

By HALDIN DAVIS, M.B.

THIS young man was exposed to infection last May, and he developed a chancre two months later. A week after that he went to see his doctor, who diagnosed primary chancre, and found that his Wassermann reaction was positive. He gave him six injections of novarsenobillon, 0.6 gm. each time, followed by six injections of mercury into the buttock, 1 gr. of mercury being administered on each occasion. Since then he has been taking mercury pills. Despite that treatment, he came to see me to-day with a perfectly definite delayed secondary syphilide. The problem now is as to how he should be treated, by what particular arsenical compound. I incline to giving him silver salvarsan, being of opinion that it is the most potent form of the drug.

Dr. WILFRID FOX said he did not think it was material which of the forms mentioned was used; the man required more general treatment, both by arsenical compounds and mercury.

Case of Lichen Obtusus Corneus.

By A. M. H. GRAY, C.B.E., M.D.

PATIENT, a man, aged 46. He seems to have had three very distinct outbreaks of this condition. The first began twenty-five years ago with what was regarded as eczema of the back of the left calf. You will agree it is typical verrucose lichen planus, though it also shows certain nodules of the same nature as those on the shin. The second group appeared ten years ago—small "pimples" on the left shin, about half a dozen in number, which were itchy. They have gradually increased in size but not in number. They now form dome-shaped tumours, about $\frac{3}{4}$ in. in diameter, with a warty surface and a central saucer-shaped depression. Mr. Foulerton, under whose care he had been, had two lesions excised about a year ago. Some sections were cut, and some of the tissue cultured, and a vaccine made from the culture was injected into the patient. Following that, this third outbreak occurred, itchy spots appearing on the front of the right leg and right forearm. All except two look like simple excoriations of the "acne urticata" type, but one particularly has developed into a lesion similar to those on the left shin but only about $\frac{1}{4}$ in. across, and a second one, still smaller, shows similar changes. He has also distinct patches of lichen planus on the inner side of both cheeks.

I think this case comes into the group of lichen obtusus corneus, but there can be no question that he has also true lichen planus and the combination of the two types of lesion suggest that they are all one disease, though there still appears to be some doubt on the subject.

DISCUSSION.

Dr. HALDIN DAVIS said he had had two very similar cases under his care. One of them was shown here many years ago by Dr. Dore, but during the last nine months the lesions had been gradually disappearing; they had almost gone from the arms, but persisted on the calves, in very much the same situation as in this man now shown. In the other case he had watched the lesions develop from severe lichen planus. The original eruption of lichen planus lasted much longer than usual, and the patient, a

woman, developed warty growths in the popliteal space and behind the ear, which itched a great deal. He had had sections of them cut. Microscopically they showed a small-celled infiltration round blood-vessels, quite a different picture from the papillomatous growth characteristic of common warts.

Dr. GRAHAM LITTLE regarded the case as a straightforward lichen planus verrucosus; he did not consider the obtusus element entered into it.

The PRESIDENT agreed with Dr. Graham Little's view that this was a case of lichen planus verrucosus. The first case of lichen obtusus corneus shown before the Section was brought by Dr. Sibley; he (the President) had then recognized the condition from a model he saw in Guy's Hospital Museum. The lesions of lichen obtusus corneus were like cones with flat tops, quite unlike the angular margined raised disc-like patches of lichen planus verrucosus.

Case of Multiple Nævi.

By A. M. H. GRAY, C.B.E., M.D.

THIS infant, now 5 weeks old, was born without any skin lesion. On the second day of life a little spot came out on the left eyebrow, and since then lesions have been coming out every day, and are still appearing. Almost every part of the body is affected. They are now very numerous, some fifty or sixty in number. Some of them, especially the early ones, appear to have the more or less typical characters of ordinary stellate nævi, whereas others were more like simple angiomas. I am not sure whether the latter begin as single dilated vessels with a spider-like nævus appearance round them or not.

DISCUSSION.

Dr. MACLEOD said he had seen congenital spider nævi in association with angiomas. The latter, he considered, started as angioma from the beginning, without the stellate arrangement.

The PRESIDENT agreed that this was a nævus, but he did not regard it as a purely vascular nævus, but as a congenital xanthoma. If the red were pressed out the lesion would be found to be yellow. Nævo-xanthoma would be his diagnosis.

Case of Morphœa Guttata.

By WILFRID FOX, M.D.

THIS woman presents an appearance so much like that in the case shown by Dr. Sequeira and Dr. O'Donovan at the last meeting,¹ that I wished members to see her. You will note the atrophic necklet arrangement. She has given some suggestion as to the ætiology of her condition. She was badly sunburnt, and the lesions appeared over the sites of the blisters which arose during the sunburning. Some of them seemed to be typical morphœa, especially those on the chest, which probably was not a sunburn area. Some look like lupus erythematosus, which often follows sunburn or other external irritant.

¹ *Proceedings*, 1921, xv, p. 10.

Nævo-xantho-endothelioma (?) with Epidermolysis Bullosa.

By G. W. SEQUEIRA.

D. L., AGED 17 months, female, presents xanthoma-like lesions on hands and feet. They were first observed soon after birth, and appeared in clusters on the nose and other parts. The mother states that many of the clusters have disappeared. At the present time the lesions are confined to the hands and feet. From birth also the infant has suffered from epidermolysis bullosa; any damage to the skin from traumatism, such as blows, friction or pressure, is followed by characteristic bullæ. The mother of the child has also suffered from a combination of the two maladies, and still shows some nodules, and blisters form after damage to her skin, although not so readily as they did when she was younger.

The grandmother of the child states she feels sure she had the same little yellowish nodules when a child, and used to be subject to blisters when she damaged her skin. She remembers, too, that her father suffered in the same way after injuries, as did also her sister and her sister's two sons. One of these boys suffered from diabetes, from which he died at the age of 12, a point of interest in connexion with the xanthoma-like lesions in the other members of the family.

The nails of one or two of the fingers show degenerative changes, probably the result of blebs having formed beneath and around the nail leading to changes in the nail-plate, and thus interfering with its growth.

DISCUSSION.

Dr. PRINGLE said he thought that the lesions called "xanthoma" were merely desiccated bullæ from the epidermolysis bullosa, with epidermal cysts.

The PRESIDENT agreed that the epidermal cysts were characteristic of epidermolysis bullosa.

Rodent Ulcer: Superficial Cicatrizing Type.

By G. W. SEQUEIRA.

THE patient, a lady, aged 71, first noticed something wrong with her nose in the spring of 1915. One morning on awakening from sleep she noticed three little punctures on her left nostril, and thought she had been bitten by a mosquito. The cicatricial area of the ulcer is surrounded in part by the typical rolled edge, whilst ulceration and scabbing are to be observed in the remaining part of the circumference.

Case of Eczema associated with Asthma.

By H. MACCORMAC, C.B.E., M.D.

PATIENT, a man, aged 42, joined the Field Artillery in 1902. In the following year he developed an eruption on the hands, arms, and slightly on the neck. This recurred from time to time until 1910, when he went into the

Reserve, whereupon the skin eruption entirely ceased. In 1914 he rejoined the Army and once again the skin disease appeared: he also developed asthma. The skin disease therefore corresponded with the period at which he came into contact with horses. My colleague, Dr. Izod Bennett, kindly tested his cuti-reactions to foreign proteins, and obtained a positive response to dog and horse. In this case it might appear that both the asthma and the dermatitis were due to sensitization to horse protein, but five injections of horse serum have been given, beginning with $\frac{1}{8}$ minim, and working up to 5 minims, without improving either condition. It may, therefore, possibly be concluded that the two conditions are accidentally associated, and that the dermatitis is not a consequence of "horse sensitiveness."

Dr. F. PARKES WEBER said he saw no connexion in this case between the treatment and the suggested cause of the asthma and eczema. Sensitiveness to horse serum was different from sensitiveness to horsehair and the cutaneous secretions of horses. Only occasionally was a human being abnormally sensitive to both.

Section of Dermatology.

President—Dr. H. G. ADAMSON.

Case of Sclerodermia (Sclerodactyly Type).

By J. H. SEQUEIRA, M.D., F.R.C.P.

PATIENT, a female, aged 24, married, was admitted into the London Hospital on December 15, 1921. She is a Polish Jewess, and came to England when she was two years old. The family history is good. She has two children, one aged 4, and one born (at the seventh month) on March 16, 1921. Both children are alive and well. In December, 1920, when she was three months pregnant, her hands and feet became swollen and painful, and this condition persisted after confinement and gradually increased in extent.

The face is mask-like, smooth and immobile in expression. The eyelids can be approximated, but the palpebral fissures cannot be tightly closed. Smiling is possible. The teeth are easily exposed. The skin is of a dull earthy colour. It is tough on palpation. There is no epiphora and no ectropion.

The fingers are flexed at the first and second phalangeal joints and are kept so. The skin is smooth and polished in appearance. Over the extensor surface of the first joints there are septic ulcerations of the stretched skin. The right elbow can be bent from 90° to 60° . The toes can be flexed and extended. They are rather bluish in colour and feel cold. The skin of the feet, legs and thighs is hard and rigid. There is no oedema. The shins are painful. The knees are permanently flexed at 160° , but can be easily bent to a right angle. The ankles are stiff, and the arches of the feet are exaggerated. On the front of the chest and to a less extent over the shoulders, the skin is inelastic, smooth and moist. The movement of the shoulders is not painful and is free, but little used on account of the pain in moving the elbows. The skin of the affected parts everywhere is tough, inelastic and unpinchable. These areas are pigmented, and there are pigment patches independent of the sclerosed skin. There is no alteration in sensation. The thyroid gland is not palpable.

The patient has now been in hospital six weeks and has greatly improved. She feels better, the skin is more supple, and the septic pressure sores have healed. She has been taking thyroid, and has had regular massage of all the affected parts.

The special interest in the case lay in the onset of the disease during pregnancy.

Dr. GRAHAM LITTLE referred to a case of extensive sclerodermia which he exhibited some years ago, in which on two occasions thyroid gland was engrafted into the tibia by

Kocher, at Berne. After each of those treatments there was material improvement. A year after the second operation there was a further return of the trouble. She was again sent to Kocher, but he refused to do any further operations. She was brought back to London, and after varied treatment had all her teeth extracted; and after that had been done the whole condition improved almost beyond recognition. Previously she had had to be carried about and fed by others, as she could not lift her hands to her mouth. He had seen her again recently, and she had now resumed playing the piano, and she was no longer helpless. Those facts seemed to indicate a toxic cause of the condition.

Sporotrichosis (with Cultures).

By H. G. ADAMSON, M.D. (President).

THIS patient was shown at the last meeting as a case for diagnosis. She had ulcers of the leg, which did not heal for six months, in spite of treatment. They seemed to be neither streptococcal, nor staphylococcal, and were not syphilitic, tubercular, or artefact, but probably due to some unusual infection. Since she was last here, Dr. Joeques, of St. Bartholomew's Hospital, has obtained a sporothrix from a pustule. Apparently, sporotrichosis is uncommon in London; we have been on the look-out for it ten years, and very few cases have been recorded. I showed the first case here in 1911. That was remarkable, for the patient had never been out of London. I have since had three other cases of the kind, and all those others had been in either North America or South America. Since that time Dr. Norman Walker, of Edinburgh, has described two or three cases, and so has Dr. Wallace Beatty, of Dublin. Excepting my first patient, all those cases were of the type in which the patient gets a lesion on the finger, and then a chain of gummata along the arm. My first case was of the generalized type; there were gummatous lesions all over the body, and at one time she had an abscess in the anterior chamber of the eye, and sporotrichial rheumatism. In addition to those types there is an epidermal type, in which the condition remains in the epidermis, and the present case is of this type. The lesion begins as a small papule, which becomes a pustule. The pustule breaks down, and leaves a punched-out ulcer, and a grouping of these produces a bigger ulcer. I pointed out last time that the ulcers were cribriform. At first I thought this was a second London case, but I recently ascertained that she had been previously living in Dublin, and that it started there.

I can only show you the first plate of the culture. At first sight it appears to be a contaminated plate; but that is not so; only one or two kinds of organism are present on it; no staphylococci nor other skin organisms. The material was taken, with due precautions, from one of the abscesses, and put on to Sabouraud medium, and the organisms were grown at room temperature. At first there appeared what looked like bacilli, but the organisms had bulges or nodes on them, which was unlike bacilli. The sporotrichosis, a black culture, did not appear for ten days, which is the usual time. Since then it has become contaminated by a pleomorphic fungous growth, such as often occurs in the case of ringworm. Dr. Joeques has not yet had time to work out the other bacillus-like growth. During the past five days this patient has been given iodine internally, in the form of iodeol, and there is a rapid process of healing. Iodeol is supposed to contain 4 gr. of iodine to the capsule.

SHORT DESCRIPTION OF CULTURE OF SPOROTHRIX BY DR. T. JOEKES.

The pus from several of the minute abscesses was collected as aseptically as possible, and sown on different media. The plate shown is a blood-agar plate. After five days' incubation at room temperature small dull white colonies appeared, which after another three days had practically attained the present size. Several of the colonies showed dark pigmentation, which in most colonies started in the centre, and in some at the periphery. Most of the sporothrix colonies on the plate are now quite black, but a few are still white. The dark ones show the typical convolutions quite well, but this is absent in the white colonies. Both the dark and the white colonies show the typical finely fringed margins. Nearly all the colonies which have been used for making subcultures produced a copious growth of aerial hyphæ at the place where they had been touched. Besides these sporothrix colonies there are a number of ivory-white smaller colonies with well-defined margins. Films from these latter colonies show strongly Gram-positive oval bodies (? *saccharomyces*).

Case for Diagnosis.

By A. M. H. GRAY, C.B.E., M.D.

THIS woman is aged 67, and her illness began with a small pimple on the left leg about eight years ago. That pimple gradually spread until it formed a patch several inches in diameter. A few months afterwards a similar patch on the opposite leg appeared, and that also has become a patch of considerable size. The lesions were confined to the legs until seven months ago, when she developed somewhat similar patches on the scalp, and there was a patch over the right eye at about the same time. The lesions are very much like those described in Dr. Adamson's case. On these red granulomatous patches one sees a large number of pustules, which are the size of a pin's head when they first appear and increase until they reach the size of a pea, then they burst, leaving a little ulcer. The lesions on the scalp and on the legs are of the same character. There have been smaller isolated lesions on the thighs, but most of these are healed and have left sharply-defined scars behind. Cultures from these pustules have given pure growths of *Staphylococcus aureus*. The Wassermann is negative, but von Pirquet's reaction is strongly positive.

The chief reason for my bringing the case is to ask whether such lesions could be produced by ordinary pus organisms. I do not think they can be. I do not doubt that in this case there is some underlying granuloma, and that the pustules are secondary septic contaminations. She has had a very varied treatment: local antiseptics, eusol, flavine, weak mercury, &c., and yet the pustules have gone on forming in much the same way. The scalp has quieted down more under 25 per cent. ichthyol than under anything else. At one time it was very painful. At one time she was taking potassium iodide internally, but it appeared to have no effect on the lesions. Clearly it is not syphilitic, but whether it is tuberculous or whether it is caused by an organism of the fungus group, as in the President's case, is a question which requires further investigation.

DISCUSSION.

The PRESIDENT thought the lesions in this case resembled those in his own case; but non-improvement under potassium iodide was against it being a sporotrichosis.

Dr. ALDO CASTELLANI agreed that sporotrichosis lesions disappeared quickly under iodide of potassium if given in full doses. But the causal fungus in this case might be a different one; for instance there were fungi in the Tropics which caused very similar lesions, and on which iodide of potassium had very little effect. At least 20 to 30 gr. three times a day should be given. He had found it a great advantage, in preventing symptoms of iodism, to mix the medicine with bicarbonate of soda, and adding a little glycerine or syrup prevented a sediment forming.

Dr. GRAY replied that this patient had not been given more than 30 gr. of iodide of potassium daily. That had been continued for about a month.

Pemphigus Foliaceus.

By A. M. H. GRAY, C.B.E., M.D.

THIS woman, aged 50, has had this condition since 1905. It began on the chest and back with small blisters, and these blisters gradually spread over the body until the whole of it, except the palms and soles, was involved. The nails have been affected, have fallen off, and others have grown. She was in University College Hospital under Dr. Crocker in 1905-6 for about a year, and since then was for a time under Dr. Sibley at St. John's Hospital, and I have now had her under observation for some time, but the condition has certainly remained stationary since she has been under my care. Her doctor had given her some injections of staphylococcal vaccine made from the contents of the blisters, and he was satisfied there was an improvement. We tried her for two or three months on similar lines, but got no improvement. Among the things she has had are arsenic, including enesol and cacodylate of soda, antimony, salicylates, quinine, various intestinal antiseptics, colon irrigations, as well as dietetic treatment. In spite of the extensive skin eruption her general health is very good. No organisms of importance have been found in her excreta, and her blood count is normal.

Dr. CASTELLANI said several French authorities had recommended quinine internally and plain sulphur ointment externally for this condition. He saw a very bad case of it in a French soldier in Indo-China, who was treated in this way by some French doctors. This case was a typical one with marked eosinophilia, etc.

Case of Lichen Obtusus Corneus.

By W. KNOWSLEY SIBLEY, M.D.

THIS girl, aged 11, has for two years had an eruption of a papular character over the body. The mother says the lesions commenced on the legs, and have gradually spread over the body. At present the shoulders are extensively affected, she has lesions all down the arms, a few lesions on the front of the chest, and the legs are much involved. She says they do not itch, but she has picked off the heads of a large number of the papules; the mother says the girl scratches herself during sleep. Vesicles have not been seen about her, and she had not had any treatment before she came to me. I have not given her anything internally, but she has had three small applications of X-rays to the shoulders, and there is a considerable subsidence of the lesions in these regions. She has typical lichen planus papules over the elbows and shoulders, and many

of the lesions above described are horny in character, especially those on the anterior of the legs and shoulders. I suggest they are allied to those found in lichen obtusus corneus, three cases of which I have shown here, but in this condition it is often difficult to find lichen planus lesions on other parts of the body. Some of the lesions are distinctly annular, with recent small lichen planus papules occurring in the periphery of the lesions. Some of the lesions, especially about the elbows, are in a linear formation.

The PRESIDENT agreed that this was lichen obtusus corneus. This case showed what these cases did not always show, namely, lichen planus papules on elbows and arms, and lichen planus annularis papules on the back. It was an interesting case as demonstrating the connexion between lichen planus and lichen obtusus corneus.

Lupus Erythematosus with Rheumatoid Arthritis.

By H. W. BARBER, M.B.

THIS is one of four cases of lupus erythematosus associated with rheumatoid arthritis that I have recently come across, and the patient is of interest because, apart from these two conditions, she has retrobulbar optic neuritis, of the type which, according to ophthalmic surgeons, is usually associated with some infection, generally of the teeth. She was well until four years ago, when she began to feel "run down" and had neuralgia. The lupus erythematosus began on the nose, later spread to the cheeks, and then appeared on her hands. At the same time she developed arthritis, involving chiefly the metacarpophalangeal joints of the hands, the knees, the shoulders, and the elbows, and, in addition, the temporo-mandibular joints. When I first saw her last November she had quite extensive patches on her cheeks, but these have now disappeared, perhaps because she has been kept at rest in bed. All the time she has been under observation she has had pyrexia of varying degree. Occasionally she gets an acute exacerbation of her arthritis, and then there is an increase of fever. Obviously she is being infected from somewhere, but I am not yet sure from what source. Before I saw her she had had some teeth removed, which I believe were septic, and there followed a temporary improvement in her arthritis. There seem to be no apical abscesses in her remaining teeth, but pus pockets were found, from which a strongly hæmolytic streptococcus has been isolated, but it is too early to say whether that is the responsible organism. There is no clinical evidence of tubercle. X-rays reveal some opacities in the lungs, but there are no lung symptoms, neither do there seem to be any tuberculous glands. The ulcer on the nose was caused by carbon dioxide snow treatment.

DISCUSSION.

Dr. SIBLEY said he had at present in St. John's Hospital a remarkable case of lupus erythematosus disseminatus, in the person of a comparatively healthy young woman, who came with an obscure dermatitis on her chest, arms and fingers. After being in a few weeks she developed a typical lupus erythematosus butterfly patch across the nose and contiguous parts of the cheeks, with a well-defined margin. In two or three weeks that completely disappeared, but the body lesions became more pronounced. Recently she suddenly developed a large bulla on her right leg, and her temperature rose to 105°6 F. Two or three days later she had a bulla on the right arm, when she had a rapid pulse and seemed ill. These lesions have now completely subsided, and her

temperature was down to normal. A few days later the typical erythematosus area re-appeared over her face, in the former butterfly form, and it seemed likely to disappear again without leaving anything behind. He did not know what was the connexion between the bullous eruption and lupus erythematosus, and he did not know what was the source of her trouble, unless it were her throat; she had enlarged tonsils, and she had complained of a sore throat. Her feet, especially the soles, were always excoriated and very sore, and but for this he would have brought her to be shown. He considered that the prognosis in these cases was distinctly bad.

Dr. F. PARKES WEBER asked whether there was any disease in the pelvic organs, and whether the urine had been examined for the presence of the *Bacillus coli*.

Dr. GRAY asked whether Dr. Barber had had the blood cultivated in any of the four cases. He had recently had under care a case which had been under Dr. Sequeira and was very much improved by him by means of intravenous injections of quinine. The edge of the original patch, however, had never quite quieted down. Dr. Gray had got Dr. Teale to give her streptococcal vaccines and she had a bad reaction after the third injection. When that subsided there was not much improvement in the lesion. A few weeks after this reaction her temperature suddenly shot up to 105° F. in a few hours, and she complained of pain in the back of one ear. In a very few hours a sharply-margined patch began to spread forwards, and in twenty-four hours she had a whole lupus erythematosus area standing out like erysipelas. In three days this had subsided, and the temperature was down to normal, and the swelling gradually subsided. In the acute stage Dr. Goodhart took cultures of the blood. He inoculated four tubes and two of them grew a hæmolytic streptococcus, one was sterile and one grew a *Staphylococcus albus*. That was interesting in view of Dr. Cranston Low's cases, reported in the *British Journal of Dermatology*,¹ in one of which he isolated hæmolytic streptococcus from the heart blood.

Dr. J. H. SEQUEIRA said that lupus erythematosus was still generally regarded as a skin disease, whereas in the view of most dermatologists, it was a manifestation of septicæmia. With regard to the streptococcal hypothesis, some years ago he had under care a 15-year-old girl who had most acute lupus erythematosus. Before her death she developed an enormous abscess in the thigh which was found to be streptococcal. But he did not think it was proved that that organism was the sole cause of the condition. In several of his cases of this acute type great benefit had resulted from the intravenous injection of quinine, and one hæmorrhagic case of lupus erythematosus had cleared up under this treatment, but that patient also had now relapsed. The dose was 5 gr. hydrochlorate of quinine in 10 c.c. normal saline, first injected once a week and then twice a week. In some there was slight shock at the time of the injection; nearly all his patients had had quinine before, and even while the injection was being done, complaint was made of a bitter taste in the mouth.

The PRESIDENT said a notable feature in this case was the association of rheumatoid arthritis; he had himself had three or four cases showing the same association.

Dr. GRAHAM LITTLE was able to recall two cases of the kind. The first was taken into St. Mary's Hospital as "acute rheumatism"; the rash was not recognized until later, when he diagnosed extensive lupus erythematosus. The patient died soon after. Recently there had been another case of the kind at St. Mary's: it ran a very acute course, and death occurred three months after admission.

Dr. BARBER (in reply) said the patient's urine was sterile; he had not had the pelvis examined as the patient was unmarried. No abnormal organisms had yet been found in the fæces. In one case of lupus erythematosus which he had observed, septicæmia developed, presumably of streptococcal origin, but blood cultures were sterile. However, it seemed to him that when these cases became acute their condition resembled a streptococcal septicæmia far more than a general tuberculosis, and he did

¹ *Brit. Journ. Derm. and Syph.*, 1920, xxxii, p. 253.

not think there was any evidence that lupus erythematosus bore any direct relationship to tubercle. He thought, on the other hand, that considerable evidence had now been collected to show that in some cases, at least, a streptococcus was the causal organism, as it was in many cases of rheumatoid arthritis.

Parakeratosis Variegata.

By H. W. BARBER, M.B.

THIS boy, aged 13, came to me a few weeks ago with an eruption which I diagnosed as belonging to the parapsoriasis or parakeratosis variegata group. The eruption first appeared at the end of last September, first on the arms, then on the shoulders and legs. There are no subjective symptoms, and very little scaliness. On the shoulders particularly there are telangiectatic spots such as I have not seen before in similar cases, but Dr. MacLeod tells me that in the case which he first described over here there were definite telangiectases. I was interested to read, in an American paper, of good results in this disease from the use of ultra-violet light, and I propose to give it a trial.

DISCUSSION.

Dr. MACLEOD agreed with Dr. Barber's diagnosis. He did not know of so young a case having been recorded. One point of interest which he had been trying to work out was the idea that it was not a toxic condition. One of the earliest recorded cases, a case of Dr. Colcott Fox, was that of a man whose work was of a confined character, who always said he suffered from the heat. Not long ago the speaker saw a man with a very typical parakeratosis variegata on the arms and legs. He was a very intrepid flying man; he had done some very high flying, and was fond of going in for "stunts." That man said the condition had been present before, but it was made much worse since he had flown to great heights. The whole arrangement of the lesions was extraordinarily like that of erythema ab igne, and there might be some physical cause for it.

Dr. GRAY said he could not state what was the effect of ultra-violet rays on parakeratosis variegata, but he had had two or three cases of parapsoriasis en plaque which he had treated with the quartz lamp, and he was at first very much impressed with the result; but when the treatment was stopped the condition recurred. None of them had been any better for it, ultimately.

Case for Diagnosis.

By E. G. GRAHAM LITTLE, M.D.

PATIENT, a man, aged 75, has suffered three years from the skin condition now present. For two years he has been subject to profuse sweats, especially at night. In coming from St. Mary's to this building this afternoon the exertion made him wet through. He gives a history of boils for forty years, and he had a recurrence twelve months ago. Two sisters and one brother died of what is reported to have been cancer. There is much thickening of the skin of the nape of the neck and of the scalp and eyebrows, with consequent loss of hair. He has sheets of large comedones on the chest and on the thighs, and on the legs this has diminished to a more finely follicular eruption, like pityriasis rubra pilaris. Microscopic section of a specimen, which I am showing, reveals

the lesion as a cystic dilatation in the corium, lined with epithelium and containing a mass of hyperkeratinized tissue occupying the lumen of the cyst. At first I thought it was a case of Darier's disease, but it is not much like it histologically; there are no rounded bodies. The case has puzzled me, and I have brought it for diagnosis.

Section of Dermatology.

President—Dr. H. G. ADAMSON.

Case for Diagnosis.

By LOUIS SAVATARD.

A MIDDLE-AGED lady consulted me in August last with regard to this widespread erythrodermia which had first appeared in January, 1921. Its primary situation was around the axillæ and on the hips, but in August the area of invasion had extended from the level of the axillæ to half-way down the thighs. The application of sulphur ointment had been prescribed by her doctor. The intense itching subsided with the discontinuance of the ointment and up to the last fortnight there had been no extension of the eruption. Since then, three fresh foci have appeared on the flexor aspect of the left forearm as oval patches, simulating lichen scrofulosorum. There is still slight irritation at night. There is no itching of the healthy skin nor of the areas which have responded to X-ray treatment. The eruption is of a dusky red colour. There is fine scaling and some slight infiltration. The large white areas are due to the effect of the X-rays; the smaller islands of normal skin have not been so treated.

Last October, I treated the condition with X-rays, apparently without effect, but after a month's rest the patient wrote asking for more, as she believed the X-rays had done good. Treatment was re-commenced and I found that a half-pastille dose was sufficient to clear any given area. There has been no relapse so far on the areas treated.

My first diagnosis was that it was a parapsoriasis. I have found similar intolerance to sulphur in other cases of parapsoriasis and in many of them too there is some irritation at night. On the other hand I have never found a parapsoriasis respond so distinctly to X-rays. Lately I have suspected that the condition might be a premycosis, though I had previously found that a mild sulphur ointment allays the itching of a premycosis. A blood count shows only slight anæmia. No biopsy has been made but I hope to present a section at a future meeting.

DISCUSSION.

Dr. J. H. SEQUEIRA agreed with the diagnosis of premycotic dermatitis, on three grounds: (1) The clinical appearance of the eruption; (2) on palpation one could feel infiltration; (3) the response of the lesions to the X-rays. The areas which had received a half-pastille dose of the rays were quite clear.

Dr. H. W. BARBER referred to two cases which he showed two or three years ago as instances of premycotic erythrodermia; their appearance was much like that in this case. One of his patients was a man, the other a woman. The woman subsequently

developed tumours and died in an infirmary. He found that though X-rays could effect the disappearance of the pre-mycotic condition, fresh areas of the eruption were always forming. The man eventually became a typical "homme rouge," remained like that three or four months, and then his skin rapidly became normal. He afterwards developed further areas, as in the present case, but never tumours. He recently died of pneumonia. He (Dr. Barber) had wondered whether this was really a case of the condition described by Dr. Sequeira as lymphoblastic erythrodermia, and not true mycosis fungoides.

Dr. G. PERNET said this case certainly looked like the early stage of mycosis fungoides. The rounded islets of normal skin in the reddened areas were characteristic in his opinion. In an early case of this kind, he would especially recommend an effervescent mixture of quinine (3 gr. or more to the ounce t.i.d.).¹ He had never known a case of established mycosis fungoides recover under X-rays.

Cases of (1) Arsenical Jaundice, (2) Arsenical Dermatitis, showing the Results of a Special Treatment.

By FREDERICK CHAMBERLAIN, L.R.C.P.Lond., M.R.C.S.Eng.

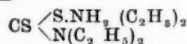
Case I.—Severe jaundice occurred twelve weeks after last injection of a course of six intravenous injections of N.A.B. The liver was slightly enlarged and the urine highly coloured. Arsenic (Marsh test), bile pigments and a trace of albumin were found in urine. The patient received intravenous injections of contramine at two-day intervals. In nine days the urine was normal, but some tinting of conjunctivæ remained. It is now nineteen days since onset of jaundice and sixteen days since treatment was begun. The patient is perfectly well in himself. The liver appears to be of normal size. The conjunctivæ are still faintly yellow.

Case II.—Dermatitis occurred after third injection of "606" as an itching erythema. The injections of "606" were continued and the skin began to exfoliate. Patient was admitted to the hospital after the fifth injection. Extensive exfoliation over whole body. "Weeping eczema" was present on the scrotum, in the groins and in the flexures of knees and elbows. There was blepharitis. An injection of contramine was given and locally a lotion of liquor calcis, olive oil and eucalyptol. The patient subsequently received four further injections of contramine, at three-day intervals. He was better after the second injection and the offensive odour was gone. "Weeping" ceased after the third injection. It is now the thirtieth day of the dermatitis. The patient feels very well. The backs of hands are rather dry and rough. One large pad of exfoliating skin is not yet freed from plantar surface of left heel.

Contramine is given, dissolved in 10 c.c. of normal saline, or normal saline containing 10 per cent. glucose, by means of a 10 c.c. syringe, intravenously.

DISCUSSION.

Mr. McDONAGH said the formula of contramine, the carbon di-sulphide product of di-ethyl-amine, was as follows:—



He added that in 1915 he introduced intramine (di-ortho-di-amino-thio-benzene) with the object of overcoming metallic intoxication, because experiments he had under-

¹ See Pernet, "Case of Mycosis Fungoides," *Proc. Roy. Soc. Med.*, May, 1921; *Brit. Journ. Derm.*, 1921, xxxiii, p. 344.

taken showed that non-metals were antidotes for metals, and vice versa, both in shock and intoxication. Intramine had two disadvantages: (1) It caused pain when injected intramuscularly; (2) the high protection necessary for intravenous work detracted from its therapeutic action. Experiments were undertaken to find a sulphur compound which would be soluble in water and contramine was the result. Contramine contained 28 per cent. of sulphur, it was soluble in water, 1 in 2.5, it did not cause pain when injected intramuscularly, it could be injected intravenously in solution, smaller doses were required (0.25 to 0.5 grm.) and it was more potent than intramine, owing to the fact that the sulphur was more rapidly dissociated.

Dr. W. J. O'DONOVAN said that the great interest and difficulty in these cases of post-salvarsan icterus lay in the uncertainty of the underlying pathological state. In work involving the daily use of salvarsan preparations, these cases appeared in small epidemics, and in the environment of a venereal clinic the whole prepossession was to make a diagnosis of salvarsan jaundice; nevertheless, it was noteworthy that any general physician called in to such a case failed to make a differential diagnosis from catarrhal jaundice. A similar difficulty was experienced in dealing with T.N.T. jaundice. Very few of these cases died: the duration of illness and of jaundice also being very variable. In fatal cases liver atrophy was found post-mortem, but in the great majority of cases that recovered with or without treatment, the histological changes in the liver could only be surmised. It was most difficult to attribute any special value to a proposed treatment for a condition of uncertain pathology in which the natural course of the disease was towards recovery. He (Dr. O'Donovan) refrained from the employment of any specific therapy for post-salvarsan jaundice; he kept the patients in bed and treated the case symptomatically. In order to obtain a true knowledge of the toxicity of salvarsan one had to follow up the life history of such cases for a long period of time.

Dr. A. M. H. GRAY said he thought there was a great difference between these two types of cases. He would not have thought there was much doubt about the dermatitis case; but the jaundice case was, in his opinion, another story. During the last two and a half years he had had three cases of jaundice, and they all occurred in the summer of last year; they were of the mild catarrhal type, and they cleared up in less than a fortnight, with very little treatment. He did not think the course of a case could be foretold at its commencement. He had had four cases of dermatitis, and they all ran the same kind of course, though one had been complicated by nephritis; but in all of them the skin rashes cleared up in about three months. Two of them were treated with intramine, the other two without it, and he did not notice any difference between them. It was of interest to learn that Mr. McDonagh had a preparation which would cut short the course of these cases.

An Unusual Case of Multiform Dermatitis Factitia.

By GEORGE PERNET, M.D.

PATIENT, a female, aged 27, a domestic servant, states she was born with skin trouble about the left leg, and that the doctors wanted to take off the leg. She also says that she has had the skin trouble ever since she was vaccinated in infancy. The wide extent and multiformity of the lesions should be noted. Recently she has had blisters, oblong in shape, or tailing off into a sort of comma; and there are scars and crusting at the sites where the blisters have occurred; also a cigarette-paper looking atrophy and intermediate transitional appearances. Here and there are white patches flatly and slightly raised above the general skin level, a kind of pseudo-lichen planus albus, with discrete raised, angular, flat-topped, shiny white papules here and there beyond the

patches. I feel no doubt about its being an artefact. I read a paper before the American Dermatological Society in 1909, on "The Psychological Aspects of Dermatitis Factitia"¹ in which I commented on the apparent absence of motive in many of these cases, expressing the view that alternation of personality might, perhaps, be the explanation of them.

Case of Unilateral Morphæo-sclerodermia Faciei.

By GEORGE PERNET, M.D.

PATIENT, a boy, aged 11, attended my out-patient department, West London Hospital, four months ago with a patch on the centre of the right cheek about the size of a florin, which, when first noticed two months previously, was about the size of a sixpence. There is also a certain amount of longitudinal morphæa, whitish-lilac, occupying the lower right eyelid. The condition is improving under zinc ionization.

Case for Diagnosis, previously exhibited (? Dermatitis Artefacta) showing Result of Treatment.

By J. H. STOWERS, M.D.

It will be remembered that I showed this female patient (aged 41) at the November meeting of last year as a case of alleged artefacta and that it was reported in the Society's *Proceedings* in January.² The lesions were multiform and limited to the anterior surface of each leg, being red, raised, thickened and painful and are said to have existed for upwards of twelve years. The remarkable configuration of the lesions, some with distinctly angular margins, tended to support the diagnosis. The majority of the members present agreed with the diagnosis expressed, which rested between trauma, lupus erythematosus, symmetrical sclerodermia, atrophic lichen planus and a tuberculide, but the opinions were not unanimous. For two and a half months the legs have been continuously encased in starched bandages without other treatment, with the result that marked progress has been made towards recovery, several of the smaller lesions having almost entirely disappeared, staining of the skin alone remaining. If it is artefact, I have never previously seen a case corresponding in extent and position to this, but I am not yet persuaded that the diagnosis is incorrect. Failing this, the only alternative tenable, I think, is a very unusual development of sclerodermia. You can now see the altered appearance of the limbs.

DISCUSSION.

Dr. A. M. H. GRAY said he had seen this case when it was last exhibited and he did not think this was an artefact, but regarded it as sclerodermia. In spite of the fact that the patient was now better, he still adhered to that view. The patches had been coming out for a considerable time, yet they were all exactly alike. That would not be expected in an eruption which had been artificially produced; there would be varying

¹ Pernet, *Journ. Cut. Dis.*, 1909, xxvii, p. 547.

See *Proceedings*, p. 7.

stages of their production. Secondly, he did not think any of the lesions were strictly scars; he thought there was still an active inflammatory process going on, with fibrosis. There was a difference between a scar formed by the application of an acid, and the fibrosis associated with scleroderma; the latter might get completely well without leaving any mark, and he believed that would happen in this case.

Dr. MACLEOD said he did not see the case on the previous occasion, but the lesion on the top of the left leg seemed to him characteristic of scleroderma.

Dr. H. G. ADAMSON (President) said that when he saw the case on the present occasion, he did not recognize it as the same as the one shown in November. He diagnosed it as scleroderma, but on the previous occasion he thought it was dermatitis artefacta; the latter could not, even now, be altogether excluded.

Dr. STOWERS replied that he had never seen an admitted case of scleroderma corresponding to the conditions which his patient had developed.

Psoriasis in an Infant.

By HALDIN DAVIS, M.B.

PATIENT, an infant, aged 7 months; when 4 months old a scaly eruption developed; this gradually spread, so that now it is almost universal; there are a few unattacked areas on the chin, the hands and feet. My diagnosis is psoriasis, notwithstanding the age of the patient, though I admit it has now become almost a case of dermatitis exfoliativa. A point in favour of the diagnosis is that the mother has had psoriasis, and when I first saw the child the eruption was in circinate rings. I do not think it is due to the use of an irritating ointment, though "cadum" has been used, and at another hospital sulphur and zinc ointment were supplied. Nor do I think it is a case of infective dermatitis.

DISCUSSION.

Dr. A. M. H. GRAY said he did not consider this case to be one of psoriasis. The condition started as an ordinary rash on the napkin region, and he would have thought it was exfoliative dermatitis secondary to intertrigo. There seemed little justification for the diagnosis of psoriasis; the fact of the mother having had that disease did not count for much.

Dr. O'DONOVAN said that if this case was one of psoriasis he must have made many errors, as he had seen many well-nourished children with a similar generalized eruption, and the diagnosis of psoriasis had not occurred to him in regard to them. He regarded this as a case of coecal infection.

Dr. H. G. ADAMSON (President) agreed with Dr. Haldin Davis that this was a case of extensive psoriasis. Dr. O'Donovan had stated that a general exfoliative dermatitis was frequently met with in children, but this was not his (the President's) experience. His opinion was that there were several different forms of generalized dermatitis in babies which should be distinguished, namely: (1) "Seborrhæic dermatitis," seldom universal and attacking particularly the scalp and the flexures; (2) "Dermatitis exfoliativa neonatorum (Ritter's disease)," which was really an extensive bullous impetigo (pemphigus neonatorum); (3) "Dermatitis exfoliativa," a universal erythema with desquamation often due to a drug, such as mercury, quinine, salicylates; and an extensive psoriasis. The present case he believed to be psoriasis, because of the sharp margins of the eruption, abutting on areas of healthy skin, without the outlying follicular

papules of seborrhoeic dermatitis or the phlyctenular lesions of bullous impetigo. The fact that the eruption was not universal excluded true "dermatitis exfoliativa." That the mother had psoriasis was also in favour of this diagnosis. Although it was rare to meet with psoriasis in infants, he had before seen psoriasis present in mother and baby.

Dr. GRAHAM LITTLE regarded the condition as an infectious eczematoid dermatitis, as so called by the Americans; he did not consider there was any psoriasis in the case at all. Psoriasis in young children was very rare indeed, and in order to make such a diagnosis it was necessary to be very certain about the facts—a very difficult matter in this instance.

Dr. HALDIN DAVIS (in reply) said that the primary lesion of the psoriasis could still be seen to some extent in the sharp margins of the sealy patches. He was content to leave the arguments in favour of the diagnosis of psoriasis in the hands of the President, who had presented the case for psoriasis far more ably than he could have done.

Recklinghausen's Disease with Pituitary Tumour.

By H. W. BARBER, M.B., and MAURICE SHAW, M.B.†

(I) REMARKS BY DR. MAURICE SHAW.

THIS boy, aged 15, was brought to hospital because of his obesity. He has never had any illness. He was taken in for the purpose of investigation, and the signs of Recklinghausen's disease were found. There is a large type of pigmented patch, and he has some soft subcutaneous nodules, one of which was removed for examination, but the report has not yet been received. Bilateral optic atrophy is present, and the X-ray shows a small shadow between the anterior and posterior clinoid processes. The sugar tolerance is raised. Still, he has not the typical Fröhlich's syndrome. He is sexually precocious, and he seems to have a mixture of excessive secretion of the anterior lobe and diminished secretion of the posterior lobe. No other member of the family has had any similar affection. His condition is now improving.

(II) REMARKS BY DR. BARBER.

A YEAR ago I showed, with Mr. Ormond, a case of acromegaly associated with Recklinghausen's disease, and the suggestion was that the patient had a neurofibroma of the optic chiasma which was irritating his pituitary body. This patient also has the signs and symptoms of pituitary tumour.

DISCUSSION.

Dr. G. PERNET said the late Sir Victor Horsley, several years ago, gave him some skin from a case of advanced adipositas cerebri in a woman. Dr. Pernet had cut and stained sections, and found general hypertrophy of the true skin as well as an increase in the hypodermic fatty layer.¹

Dr. F. PARKES WEBER thought that in order to establish the diagnosis of Recklinghausen's disease this case should be further investigated. At present the boy had pigment patches which might pass for those of Recklinghausen's disease, but might

¹ Pernet, "Adipositas Cerebri," American Dermatological Association, 1909, *Journ. Cut. Dis.*, 1909, xxvii, p. 554.

also pass for ordinary pigment naevi, which were not very rare in normal individuals. There was at present no typical molluscum fibrosum on the skin, but one small tumour had been removed for examination. One or two little tumours of the nature of molluscum fibrosum were occasionally found in quite healthy persons. Of the presence of some form of pituitary disease there could be no doubt, though the sexual symptoms did not correspond to those of Fröhlich's pituitary syndrome ("dystrophia adiposo-genitalis").

Dr. WILFRID FOX did not consider this a typical case of Recklinghausen's disease. This was generally associated with either sessile or gelatinous tumours, neither of which were present in this case. The pigmentation was not of the type met with in that disease; there was a diffuse freckling, and warty patches were present. The pigmentation in this case was of a very common form. This patient, too, had no sensory signs nor any neuro-fibromata. Subjects of Recklinghausen's disease usually suffered either from itching or from a neuritic type of pain.

Postscript.—Histological examination has shown that the nodule is a neurofibroma.

Ringworm of the Nails of the Hands.

By H. C. SEMON, M.D.

RECENTLY I saw this man, who is aged 22, at the Ministry of Pensions. I made a tentative diagnosis of ringworm of the nails, and this was confirmed by microscopical examination. The patient says it has been present since 1918, when he was in a camp at Wareham; previously to its commencement he had been in France ten months, and before going to France he was in America—he is an American subject. The American authorities refused to receive him back when he was repatriated, because of the nail disease, and they returned him to us. I show him specially in order to ask about treatment. In view of his urgent desire to return home, my inclination is to remove all the nails of the hands, and treat the bases with some caustic, such as pyrogallie acid, for some time after the operation. Ringworm of nails is comparatively rare in this country, and generally only one or two nails are affected. Usually the fungus which affects the nails is a trichophyton of animal origin.

Dr. MACLEOD said that three months ago he had treated a case of much the same sort in a man from Java. In his case all the nails, both of hands and feet, were affected. He obtained a trichophyton-like fungus from the scraping, which he thought might possibly have been *Epidermophyton inguinale* but had not succeeded in growing it. The patient had had *Tinea cruris* previously. Numerous forms of treatment had been tried, without success, and it was decided to remove all the nails. This was done under an anæsthetic. The nail bed was then scraped and iodine applied. The parts were subsequently dressed with mercurial ointment. When last seen the nails were growing and appeared to be healthy.

Lichenoid Linear Nævus.

By E. G. GRAHAM LITTLE, M.D.

PATIENT, a male infant, aged 18 months, has had the condition since very shortly after birth. At present there are two broad streaks consisting of raised red discrete lesions resembling lichen planus of a somewhat hypertrophic type, extending side by side and at a distance of half an inch or so,

from the buttock to the heel on the left side. The case exactly resembles one shown by Dr. Stainer more than twenty years ago to the Dermatological Society of Great Britain, in which the diagnosis was divided between lichen planus and nævus. The patient was under 15 months old. Brocq mentions the case of a child aged 4 months with a linear eruption, which he regarded as lichen planus linearis, and in view of these parallel examples the case now shown is of interest.

Case of Grouped Comedones.

By E. G. GRAHAM LITTLE, M.D.

PATIENT, a female child, aged 1 year, with a very extensive eruption of so-called grouped comedones, extending from nape to waist over the back, and from neck to navel in front. The mother had rubbed the child with olive oil in which she had dissolved a block of camphor.

Section of Dermatology.

President—Dr. H. G. ADAMSON.

Case of Spurious Diphtheria of the Skin.

By HENRY MACCORMAC, M.D.

THE patient a male aged 51. Twenty-five years ago he contracted syphilis for which he took mercurial pills for eighteen months. He remained well until about six months ago when a sore or ulcer developed on the mucous membrane of the left cheek. Some teeth were then extracted and after this there was rapid destruction of the left cheek. He states that at this period—about four months ago—he received five injections of neosalvarsan, which at first caused an arrest of the destructive process, but that, later, in spite of the continued use of the remedy, the ulceration again became active. On January 16 he was admitted to the Middlesex Hospital; there was at this time a considerable degree of destruction of the left cheek, pus was being freely formed, and there were some constitutional symptoms. In consideration of the history and the positive Wassermann reaction it was decided to give a further series of injections of novarsenobillon. The first injection of this series was followed by considerable improvement.

On January 25 a swab was taken from the pus and was reported as giving an almost pure culture of Klebs-Loeffler bacillus. As this finding did not seem to be in complete accord with the clinical signs it was decided to inoculate two guinea-pigs with a pure culture, one animal being protected by serum in the usual manner. Before the report could be received the house physician developed diphtheria, and the patient was then removed to the fever hospital. Nevertheless in spite of this strong presumptive evidence, the animal inoculations and further culture experiments proved that the bacillus belonged to the xerosis type.

This case seems to be of interest because it demonstrates that without elaborate control tests no diagnosis of diphtheria of the skin should be made.

Lymphadenoma Cutis.

By W. KNOWSLEY SIBLEY, M.D.

C. J., NOW aged 24, was shown before the Section by myself in July and October, 1914, and again in November, 1916,¹ by the late Dr. Dudley Corbett, and on two occasions photographs of his condition were published. The small tumours, especially about the posterior part of his neck, one of which was about

¹ *Proceedings*, 1913-14, vii, pp. 276-81 : 1914-15, viii, p. 2; 1916-17, x, pp. 64-68.

the size of a tangerine orange, have more or less disappeared, probably as the result of repeated X-ray treatment. The penis and scrotum however present a mass of small tumours which completely obliterate the outline of the organs. His general health continues about the same as recorded in previous reports. Blood report by Dr. Arthur Young, January 17, 1922: Red blood cells, 6,300,000 per cubic millimetre; white cells, 25,800 per cubic millimetre. Differential leucocyte count: polymorphonuclear cells, 54.5 per cent.; small lymphocytes, 17 per cent.; large lymphocytes, 11 per cent.; large hyaline cells, 3.5 per cent.; eosinophils, 11.5 per cent.; neutrophil myelocytes, 0.5 per cent.; basophils, 1 per cent.; eosinophil myelocytes, 0.5 per cent.; transitional cells, 0.5 per cent.

PATHOLOGICAL REPORT ON SECTION.

Nodule excised from shoulder: The section shows a cellular infiltration in the corium and hypoderm. The only change in the epidermis is the flattening of the interpapillary processes. The cellular infiltration is confined to the immediate neighbourhood of blood-vessels, lymphatics and sweat coils, and consists of: (1) Polygonal cells with large pale nuclei with very well marked nuclear membranes and chromatic network; (2) fibroblasts; (3) a few small round cells; (4) a few degenerated cells with pyknotic nuclei; (5) no plasma cells. Blood capillaries appear normal, but lymphatics show well marked proliferation of their endothelial linings, with dilatation of their lumina, in places. Sweat coils show, in places, proliferation of their epithelial linings.

DISCUSSION.

Dr. WHITFIELD said he was one of those who reported pathologically on this case, but he now thought his idea was wrong. He did not have sections to stain; he had to report on a very small number of stained sections. He now thought it belonged to a rare group, of which he had seen only one instance, an ichthyosiform dyskeratosis with hyperkeratosis of the mouth of the follicle, with an inflammatory reaction around, giving rise to little nodules which were very difficult to diagnose histologically. His case, which had the lesions limited to one side of the back, developed sebaceous cysts, as in the present patient. He thought it probable that the small piece of gland from this case which was submitted to him was disintegrated gland resulting from chronic infection of the skin. 227C. F.

Dr. F. PARKES WEBER said he did not think the condition in this patient could be lymphadenoma of any kind. By that one usually meant, in England, Hodgkin's disease; abroad it was sometimes called lympho-granulomatosis maligna. To have that disease confined to the skin and subcutaneous tissue (multiple nodules) would be most extraordinary. And if the nodules were thus localized, the patient's appearance would be probably very different.

Hydroa Aestivale.

By J. M. H. MACLEOD, M.D.

THIS is a typical case of *hydroa aestivale* in a girl aged 11, who has had it during the summer weather for the last five years. The type of lesion is intermediate between lesions of the summer prurigo type of Hutchinson and the more vacciniiform type described by Bazin. They consist of dusky conical papules, about half the size of a lentil, and occasional small vesicles, some of which became secondarily infected by scratching. These, when shrivelled,

form a small scale, which, on separating, leave a pitted scar. They are present in the usual situations, namely the back of the hands and wrists, face and ears, and are absent on the neck and the covered parts of the body. The individual lesions heal up in a few days, but the condition is rendered permanent by successive crops of papules. The lesions usually appear about this time of the year and last well on until the end of the autumn. Their occurrence in a girl is of interest owing to the old idea that they chiefly affect boys—an idea not in accordance with my experience. There can be little doubt that the actinic rays of sunlight are responsible, but it is probable that there are other exciting factors, as I have known the eruption to be aggravated by wind on a dull day. The type of lesion is somewhat different to that which occurs in chronic solar dermatitis, so that it is probable that there is some underlying idiosyncrasy. It has been suggested that this may be congenital, or that it may be connected with some form of toxin. The result of treatment, so far, has been disappointing.

DISCUSSION.

Dr. S. E. DORE said he thought Dr. MacLeod was right in saying that actinic rays were not the only aetiological factors in these cases. He had had a case which was treated with ultra-violet light, and under this treatment the lesions considerably improved.

Dr. F. PARKES WEBER thought it had been said that cases of hæmatoporphyrinuria were peculiarly liable to attacks of something like hydroa æstivale. In those cases he believed it had been proved beyond doubt that the eruption was caused by the actinic rays. But subjects of the skin condition in question were by no means always hæmatoporphyrinuric, and it might be that those who were not hæmatoporphyrinuric were supersensitive to something other than the rays which caused the eruption in patients with hæmatoporphyrinuria.

Dr. HALDIN DAVIS said that he also had a case which suggested that the actinic rays were not the only factors. It was that of a lady who developed the condition comparatively late in life, i.e., after she was 20. In her case the areas affected were not those exposed to the light, for the face and hands were not involved, but the neck and forearms, which she kept covered, were affected. With increasing age the trouble had become worse.

Dr. BARBER said that during the last two or three years he had had five cases in which this condition had certainly developed during adult life; three of them were females. In these patients the lesions, especially on the backs of the hands, were exactly like those seen in cases of hydroa æstivale; there were papules, bullæ, and eczematous patches; superficial scarring was sometimes seen. In hospital, he had been able to investigate one or two of these adult cases, but not a juvenile case. All the adult patients had intense indicanuria; he did not know whether this was so in the juvenile cases. If such drugs as sulphonals were injected into a white rat or rabbit and the animal was then exposed to the sun, a rash similar to that present in this case ensued and the animal might die. He had wondered whether, at any rate in the adult cases, some product of putrefaction was absorbed from the intestine, which sensitized the skin to light. It was only a suggestion; he had no experimental evidence as yet to adduce in favour of such a theory.

Dr. DOUGLAS HEATH said he had recently seen a case of congenital hæmatoporphyrinuria in a child with a rash, very much like that in this case, on the backs of the hands and on the face. The teeth were distinctly pink. The eruption was always bad in the summer and nothing of it was seen in the winter. In addition, there were one or two small bullæ on the elbows and several on the scalp. There was also something akin to epidermolysis bullosa in the condition. A weakness of the skin seemed to be present which caused the lesions to develop after slight injuries as well as on account of sensitiveness to light.

Dr. J. H. SEQUEIRA said that some years ago he had been trying to intensify the action of the Finsen light, and he injected erythrosine into the skin. He had had to give it up because of the reaction of the skin in the areas treated by the erythrosine; it was very acute. It showed that certain bodies coming into contact with the skin intensified the action.

Dr. F. PARKES WEBER, in further comment, said that the pink coloration of teeth could be explained in cases of hæmatoporphyrinuria in early life in the same way as the green coloration, which he had once seen in a case of prolonged jaundice in the first weeks of life, shown by Dr. H. Thursfield in 1912.¹ It was said that in young animals fed on madder the dentine might become tinged. In very early life hæmatoporphyrinuria, if present in the blood in the tooth-pulp, could apparently be imbibed by the dentine, so as to give the teeth a pinkish appearance.

Dr. WHITFIELD said he had had only one case of this disease in an adult, and he had investigated her case throughout. He did not remember whether indicanuria was found, but she had a mild, though definite, acidosis. By means of drugs and dieting the condition was terminated, the acidosis being got rid of. He believed that hydroa puerorum died out as the patients became older. Acidosis was much more easily produced and was a good deal more common in children than in adults; and this case might be worth investigating from that point of view.

Three Cases of Multiple Rodent Ulcer.

By E. G. GRAHAM LITTLE, M.D.

THIS is a series of three cases. The first of my cases has a most extensive eruption of very superficial flat epitheliomata, over 100 in all. Some are not ulcerated, but are raised red plateau-like infiltrations of the skin. One had become the seat of a large red tumour $1\frac{1}{2}$ by 1 in. This was excised, and proved to be definitely typical rodent ulcer. Two of the other lesions, different in character, were also examined and were found to be early rodent epithelial proliferation. Since then five or six cases have been shown: Dr. Gray has had two, Dr. Savill one, and I have had three. They are all of the same type, with curiously red lesions. The first case I showed was mistaken for lupus erythematosus, and when I showed it here, that diagnosis was freely offered. In Dr. Savill's case there was a prior history of definite extensive seborrhœa, and in Dr. Gray's cases psoriasis had been present. We should value Dr. Darier's opinion on these cases. A recent American opinion is that these are cases of Bowen's pre-cancerous dermatosis.

DISCUSSION.

Dr. A. M. H. GRAY regretted his patients were unable to attend. A picture of the first case (shown February 19, 1920) was published in the *Proceedings*,² where a full description of the case was given. That patient had had psoriasis for years and had it at the time of exhibition, the two types of lesions being easily distinguishable, both clinically and microscopically. His age was 51. The other man was aged 42. He had twelve lesions on the body, but none of them were polypoid, as was one in the first case. There was a history of psoriasis dating from childhood, but no lesions had been observed while under his (Dr. Gray's) care. Mount, in a paper on Bowen's type of epithelioma read before the American Dermatological Association last year,³ reported

¹ H. Thursfield, *Proc. Roy. Soc. Med.*, 1912, v (Sect. Study of Dis. in Child.), p. 147.

² *Proceedings*, 1920, xiii, p. 68.

³ *Archives of Derm. and Syph.*, December, 1921, p. 769.

eleven cases of that disease. In the ensuing discussion, Sutton, of Kansas, and Morrow, of San Francisco, claimed that they had seen these cases of superficial multiple rodent ulcer; and they both concluded that the early lesions of Bowen's precancerous dermatosis were identical in character with the early lesions of the multiple rodent ulcer cases. The matter was still more interesting in view of Dr. Sequeira's case, which he published as one of Bowen's disease, but which had lesions identical with those in the cases shown by Dr. Little, Dr. Savill and himself.

Dr. DARIER said he was very glad to have had the opportunity of seeing these cases, which he had believed to be rare, but which appeared to be of not infrequent occurrence in this country. In the cases now shown the lesions were very superficial epitheliomata, with well-defined edges, and histologically were baso-cellular; there was no dyskeratosis, and they were quite dry. In Bowen's disease, on the other hand, there was dyskeratosis, and the lesions were moist. When they became malignant the glands were found to be involved, and the type of epithelioma was a distinct one of its kind. Therefore the two conditions described had nothing to do with each other. With regard to the treatment of the superficial epitheliomata, the X-rays, in considerable dosage, were usually successful.

Dr. ADAMSON (President) said that it was satisfactory to have had Dr. Darier's authority for the distinction between Bowen's disease and this type of rodent ulcer; that the lesions in Bowen's disease showed a dyskeratosis, and that there were secondary growths in the lymphatic glands, features which were absent in the rodent ulcer. He believed he was right in saying that in Bowen's disease the epithelioma showed dyskeratosis also in the glands. He thought these large superficial multiple rodent ulcers had many of the features now recognized as those of the more usual type of rodent ulcer; they had the rolled edge and the scarring. And he had wondered whether the cases really had had psoriasis or whether the superficial rodent ulcers merely simulated psoriasis.

Dr. J. J. PRINGLE said he had seen that morning a gentleman, aged 83, whom he had had under close observation for a large number of years. He had suffered from psoriasis since boyhood, diagnosed by the elder Startin, Erasmus Wilson, Robert Liveing and Radcliffe Crocker. A "rodent ulcer" had been excised near the inner canthus of the left eye in 1908 causing marked ectropion. Sir Archibald Reid had also successfully destroyed two rodents arising from normal skin on the right cheek and below the left ear, leaving healthy scars. When he came under the speaker's observation he had some typical psoriasis in classical positions (knees, elbows, extensor surfaces of arms, scalp and back) in addition to innumerable "senile sebaceous warts" over the entire trunk, one of which, situated over the sacrum, had undergone "malignant degeneration" with central ulceration, and was invading the surrounding skin, whilst many others showed earlier stages of a similar change. X-rays and radium had no beneficial effect either on the principal lesion of this type or on others in a less advanced stage, but carbon dioxide snow applied somewhat ruthlessly to more than eighty of them over a period of years had produced surprisingly satisfactory results. Unfortunately, no microscopic examination had been made of these lesions of sebaceous origin. In 1914 typical rodents arising from healthy skin were successfully removed by Mr. Hayward Pinch at the Radium Institute, from the tip of the nose and centre of the left cheek. In 1916, the edges of a few of the psoriasis lesions, on the trunk only, were observed to have altered their characters, having become raised and very firm to the touch, and a microscopic examination revealed the characteristic appearances of "rodent." Many of these had been successfully, and apparently permanently, destroyed by unscreened radium plaques, but a few patches still continued to undergo similar changes. There had never been any glandular involvement, and the old gentleman's general health was satisfactory. In the light of Dr. Darier's observations, the difference in reaction to radium between the malignant growths of different origin appeared to be of special significance and clinical importance.

Case of the Pre-tumour Stage of Mycosis Fungoides.

By E. G. GRAHAM LITTLE, M.D.

THE patient, a man aged 50, shows a large number of circumscribed roughly circinate patches of dermatitis, some 2 to 4 in. in diameter, distributed chiefly on the legs, arms and back of the body, showing a moderate but definite degree of infiltration and much itching. There are at present no tumours and no greatly enlarged glands; the earliest patches began about three years ago, and the condition has steadily progressed. Section shows an early cellular infiltration of the pars papillaris of the corium. None of the patches have disappeared, but new patches are continually forming.

DISCUSSION.

Dr. GRAY said he felt inclined to dispute the diagnosis. The lesions were very numerous, superficial and symmetrical, he could not find any infiltration, and there was but little itching. He suggested it was typical parapsoriasis en plaque.

Dr. WHITFIELD agreed with Dr. Gray's view. First, in a case of mycosis fungoides there was always a slight fullness or rising of the skin at the edge; secondly, the converse was true of parapsoriasis; that when the skin was thrown into folds there was evident a slight depression or atrophy of the skin. In this case the plaque was below the general level of the skin.

Case of Sarcoid.

By AGNES SAVILL, M.D.

THE patient is a woman aged 50. She has two large nodules on each upper arm, practically symmetrical, and two patches on the cheeks; they have been developing for eighteen months. When I first saw her six weeks ago the upper arms were much larger than now, and were purple, whereas now they are reddish. She has been having doses of pituitary and thyroid, beginning with $\frac{1}{2}$ gr. thyroid, and increasing to 2 gr., and of pituitary 2 gr. twice a day. The nodules themselves are unaffected, but the swelling between them has gone. The face nodules are very much less infiltrated than formerly.

DISCUSSION.

Dr. ADAMSON (President) said he had observed two cases very like Dr. Savill's case. One of these cases he had shown as an example of subcutaneous "sarcoid" of Darier and Roussy.¹ In the other case the subcutaneous nodules (on the arms) were associated with a typical lupus erythematosus on the face. Dr. Darier, had, however, seen Dr. Savill's case and had said that it was not a sarcoid, but that it resembled some cases recently described by Schaumann² (of Stockholm) under the name of "benign lymphogranuloma." But this was really a new name which Schaumann had suggested for lupus pernio, and he (the President) could not agree that Dr. Savill's case or his own cases (which he thought resembled it) were examples of lupus pernio; and since Dr. Darier did not identify it with the Darier-Roussy sarcoid, he felt that the diagnosis of these cases must still remain open.

¹ *Brit. Journ. Derm.*, 1912, xxiv, p. 394, and 1910, xxii, p. 89.

² For abstract of Schaumann's paper see *Brit. Journ. Derm.*, 1917, xxix, p. 225.

Dr. F. PARKES WEBER said the boy he brought to a former meeting¹ with red patches on the cheeks, &c.—in some respects resembling a case of lupus pernio—had died in an infirmary. He now thought that the case was an exaggerated example of the condition which had been described by Australian doctors² as "erythrœdema" (this was suggested by Dr. J. H. Sequeira at the meeting in question), and recently by Weston,³ Byfield⁴ and others in America as resembling acrodynia and pellagra.

A Stained Section from a Case of Kerato-epithelioma Scroti.

By GEORGE PERNET, M.D.

PATIENT, a man aged about 45. Duration, fifteen months. Clinically: An irregular figure-of-eight shaped, raised horny growth (about $\frac{3}{8}$ by $\frac{1}{2}$ in.) on the right side of the scrotum. It felt like a thick coin through a cloth. The lesion had been fomented and ointments applied, but the growth had become somewhat larger. No enlargement of inguinal glands. Diagnosis: Epithelioma. It was excised. Microscopically it showed cancer cells of the pavement kind arranged in masses penetrating the derm. Numerous horny cell nests were present. On looking up the literature of tumours of the scrotum no case of the kind was found.

Des Épithéliomes Primitifs de la Peau.⁵

Par J. DARIER (Paris).

(ABSTRACT.)

DANS la question des cancers de la peau l'intérêt de l'heure actuelle se porte principalement sur leur étiologie, sur les conditions de leur malignité relative, et sur la radiosensibilité des diverses espèces. Les acquisitions récentes relatives à la production expérimentale de ces cancers ont renoué le sujet et l'ont particulièrement mis à l'ordre du jour.

Nous avons actuellement trois moyens pour créer du cancer: les rayons X, avec lesquels on réussit rarement, la méthode n'étant pas réglée; un parasite animal, le *Spiroptera neoplastica* qui a donné des succès dans près de la moitié des cas chez les rats pies à Fibiger de Copenhague; les badigeonnages de goudron, inaugurés par les Japonais, et repris par Fibiger, qu'on expérimente actuellement dans tous les pays, et par lesquels on obtient des cancers de la peau vraiment malins avec une réelle constance sur les souris.

Il ressort de ces expériences que les causes du cancer sont multiples; qu'une même espèce de cancer peut être produite par des causes diverses et qu'un même agent peut produire des tumeurs différentes. Elles ont aussi mis

¹ April 21, 1921. Cf. illustrated account by F. Parkes Weber, *Brit. Journ. Derm.*, 1921, xxxiii, p. 228.

² Cf. A. J. Wood, *Med. Journ. Australia*, 1921, i, p. 145.

³ W. Weston, *Arch. Ped.*, New York, 1920, xxxvii, p. 513.

⁴ A. H. Byfield, *Amer. Journ. Child. Dis.*, 1920, xx, p. 347.

⁵ This paper was illustrated by numerous photographs of cases and microscopical preparations. A fuller description with the appropriate illustrations will be found in the first fasciculus of the *Atlas du Cancer* to be published shortly by the Association française pour l'étude du Cancer, and in an article by MM. Darier and Ferrand which will appear in the *Annales de Dermatologie et de Syphiligraphie*.

en lumière le rôle d'une prédisposition diverse de certaines races et certaines familles d'animaux.

Quant aux conditions de la malignité et à la radiosensibilité des cancers, il reste acquis qu'elles sont en relation avec la structure histologique de chaque tumeur. Moi qui ne suis pas cancérologue, mais simple dermatologiste, je me suis depuis 30 ans attaché à étudier la structure des diverses espèces de cancers de la peau; c'est sans doute pour cela que j'ai eu l'honneur d'être invité à vous parler de ce sujet.

L'étude de l'ensemble des cancers de la peau, y compris les sarcomes, serait trop vaste. Je me bornerai donc à étudier les 3 espèces les plus communes, auxquelles les autres variétés se rattachent plus ou moins. Les deux premières sont bien connues et je ne m'y arrêterai que pour fournir des points de comparaison; la troisième est relativement nouvelle et n'a jamais été bien décrite ni figurée.

(I) *L'épithéliome spino-cellulaire* (épithéliome pavimenteux lobulé, prickle-cell carcinoma) est l'espèce la plus commune (50%) et la plus maligne. On l'observe surtout à la bouche, mais aussi sur la face, les oreilles, et le reste du corps, sur les cicatrices, les ulcères et le lupus tuberculeux. Il débute par une verrucosité ou une corne cutanée, et sur les muqueuses par de la leucoplasie verruqueuse. Il se développe soit en surface, sous forme de "macaron," soit en profondeur sous forme de tumeur nodulaire dure; l'ulcération est précoce, anfractueuse, et parsemée de "vermiottes" caractéristiques. Son évolution est rapide; bientôt il envahit les ganglions lymphatiques et peut donner lieu à des ulcères cancéreux ganglionnaires et à des métastases viscérales, qui pourtant sont rares. Il conduit fatalement à la mort en 18 mois à 3 ans, par cachexie et hémorrhagies. Il est très radiorésistant.

Au point de vue histologique il est caractérisé par des travées relativement larges et lobulées, composées de cellules grandes et claires de type malpighien, munies de filaments d'union; elles évoluent en globes épidermiques à centre corné, centre entouré de cellules à kératohyaline et de cellules lamelleuses. Ses éléments conservant la morphologie et l'évolution des cellules du type malpighien, on peut donc donner à cette espèce de cancer le nom d'*épithéliome pavimenteux typique*.

(II) *L'épithéliome baso-cellulaire* (épithéliome pavimenteux tubulé, Basal-zellen-carcinoma, rodent ulcer) est assez commun également (30 à 40%). Il se développe surtout sur les $\frac{2}{3}$ supérieurs de la face chez les vieillards, mais aussi sur les membres et sur le tronc, et même sur les lèvres, la langue et les organes génitaux. Souvent il est une conséquence de la kératose sénile, et peut donner lieu à l'épithéliomatose multiple de Besnier; quelquefois il commence par une ou plusieurs petites perles, ou par un bourgeon rouge et érosif, ou encore par une érosion plane, en "coup d'ongle," très persistante.

L'aspect clinique de cet épithéliome est très polymorphe; j'en décris 5 types principaux: 1° *L'épithéliome plan cicatriciel* dans lequel on voit une surface cicatricielle ou ulcérée, entourée d'un ourlet de petites perles papuleuses.—2° *L'épithéliome superficiel* que j'ai appelé *Pagetoïde* (en m'excusant de prendre le nom du grand savant qu'était Sir James Paget pour en faire un adjectif), lequel est constitué par une plaque rose jaunâtre, souvent atrophique, parsemée de squames et de croûtelles, ressemblant au Paget's disease of the nipple; il siège de préférence à la face, mais aussi en taches disséminées et multiples sur le corps.—3° *L'épithéliome bourgeonnant*, qui en quelques mois donne lieu à une tumeur saillante et rouge du volume d'une noix.—4° *L'ulcus rodens*, qui est un ulcère serpiginieux pouvant progresser pendant plus de 20 ou

30 ans.—5° *L'ulcère térébrant*, qui se creuse une caverne, envahit les cavités de la face, cause d'horribles mutilations, et tue par hémorragies ou méningite.

L'épithéliome baso-cellulaire est caractérisé par la lenteur de son évolution, qui peut durer de 12 à 30 ans, par sa ténacité et sa repullulation après opération ; mais sa *malignité* est *toute locale* ; jamais il n'infecte les ganglions ni ne donne de métastases. Il est très radio-sensible.

Sa structure histologique peut être résumée comme suit : Travées étroites, bosselées, foliolées, souvent ramifiées et en réseaux, qui proviennent soit des bourgeons interpapillaires, soit des follicules pilo-sébacés, soit des glandes sudoripares. Les cellules néoplasiques sont petites, tassées, mal délimitées, vivement colorables. Elles diffèrent nettement des cellules malpighiennes, n'ont pas de filaments d'union, ne subissent pas la kératinisation et ne forment donc pas de globes épidermiques. On les a comparées aux cellules basales de l'épiderme (Krompecher). Comme elles ont perdu le type malpighien on peut appeler les tumeurs qu'elles constituent des *épithéliomes atypiques*.

(III) À ces deux espèces bien connues et généralement admises il faut en ajouter une troisième, que j'étudie depuis plusieurs années, qui est une espèce intermédiaire ou combinée des deux précédentes et que j'appelle *épithéliome métatypique* (carcinoma spino-baso-cellulaire). Cet épithéliome n'est pas très rare (10 à 15%). Je l'ai rencontré surtout sur la face et notamment sur le nez, mais aussi au cuir chevelu, au cou, sur le genou, et ailleurs. Il est difficile à distinguer en clinique de l'épithéliome baso-cellulaire, et souvent c'est parce que l'on constate qu'il ne guérit pas par la radiothérapie que l'attention est attirée. Je l'ai vu débiter d'ordinaire sous forme d'une petite tumeur saillante, gris-rosé, demi-molle, translucide ; mais quelquefois c'est une érosion, ou un ulcère térébrant et mutilant. Son développement est plus rapide que celui de l'épithéliome baso-cellulaire ; il peut rester stationnaire quelques mois ou des années, et prendre ensuite un accroissement brusque avec ulcération profonde. Ce qui est important à connaître c'est que cet épithéliome métatypique peut *envahir les ganglions* et se généraliser, et qu'il est *radio-résistant*.

L'histologie est nécessaire jusqu'ici pour en affirmer le diagnostic. A ce point de vue on en peut distinguer deux types, entre lesquels il y a des combinaisons.

1° *L'épithéliome métatypique mixte* (18 cas) a la configuration et la structure d'un épithéliome baso-cellulaire, mais il renferme des *globes*. Ceux-ci sont formés de cellules lamelleuses conglomerées, pâles et acidophiles, munies quelquefois de filaments d'union, mais sans kératohyaline, lesquels entourent un centre colloïde. Il y a donc juxtaposition de tissu baso-cellulaire et de tissu spino-cellulaire, sans kératinisation complète.

2° *L'épithéliome métatypique intermédiaire* (9 cas) est d'ordinaire constitué par un réseau de travées étroites comprenant 2 ou 3 rangées de cellules ; celles-ci, plus grandes, plus claires et mieux limitées que les cellules baso-cellulaires, n'ont pourtant ni les dimensions ni toujours les filaments d'union des spino-cellulaires ; elles ont donc des caractères franchement intermédiaires. De plus on rencontre dans les travées des globes, qui, comme dans la type mixte, sont des globes parakératosiques à centre colloïde.

L'importance qu'il y a à distinguer ces 3 espèces d'épithéliomes est double. Au point de vue scientifique : on enseigne que la cellule cancéreuse est anarchique, embryonnaire ou différenciée et en somme plus ou moins atypique. Or on voit que, parmi les épithéliomes de la peau, ce sont ceux qui sont le plus

atypiques qui sont les moins malins, les plus lents et les plus radiosensibles, tandis que les plus typiques (spino-cellulaires) ont des propriétés opposées.

Au point de vue pratique : il est essentiel de distinguer ces trois espèces pour le pronostic et aussi pour le traitement, en raison de leur radiosensibilité variable. On ne peut plus dire aujourd'hui que l'épithéliome baso-cellulaire guérit toujours par les rayons X et le radium, et que cette thérapeutique ne guérit jamais et aggrave même l'épithéliome spino-cellulaire. La radiosensibilité des éléments épithéliomateux, comme celle des éléments normaux, présente des degrés et une véritable gamme. De plus, les progrès de la technique ont montré que dans les irradiations la quantité n'est pas tout, qu'il faut tenir compte de la qualité des rayons, lesquels doivent être sélectionnés par des filtres épais, et qu'il convient de faire des applications massives en une période courte.

D'une façon générale j'estime qu'on doit actuellement traiter :

1° Par l'excision chirurgicale totale et précoce : les épithéliomes spino-cellulaires opérables et les épithéliomes métatypiques limités.

2° Par la radiothérapie ordinaire (rayons X ou radium) : les épithéliomes baso-cellulaires non pénétrants.

3° Par la radiothérapie intensive ou par la radio-puncture : les épithéliomes spino-cellulaires non opérables mais accessibles en totalité, ainsi que les épithéliomes baso-cellulaires et métatypiques térébrants. Cette méthode n'a pourtant pas encore fait ses preuves complètes.

Je termine par le vœu qu'on distingue dorénavant systématiquement des tumeurs aussi différentes par leur aspect clinique, leur évolution, leur pronostic, et leur structure histologique que sont les épithéliomes spino-cellulaires, baso-cellulaires, et métatypiques. En confondant leur description dans un seul et même chapitre "des épithéliomes de la peau" on aboutit à des notions imprécises et floues, qui déconcertent les étudiants et les praticiens, et ne leur permettent pas de choisir le meilleur traitement qui convient à leurs malades.

Section of Dermatology.

President—Dr. H. G. ADAMSON.

Case of ? Erythromelalgia.

By A. W. STOTT, M.B.

(Introduced by S. E. DORE, M.D.)

(I) S. E. DORE, M.D.

THE patient, a girl, aged 16, had an attack of erythema accompanied by oedema in both legs near the ankles in December, 1916. The patches were bright red in colour and were acutely tender, especially towards night. There was no constitutional disturbance. If she went to bed and rested, it subsided in three days. Similar attacks occurred in December of each of the next two years. In 1919 the condition started in November, and has persisted since that date. She suffers, though only slightly, from chilblains on the toes. She has had tonsillitis occasionally. No other member of the family is similarly affected. Her general condition seems to be good. Temperature, urine, blood and stools are normal. I thought it might be erythromelalgia, chiefly on account of the bright red patches, and the fact that she is always worse when in the upright position.

(II) A. W. STOTT, M.B.

When I saw the patient a year ago I thought the condition was lymphangitis, due to infection, probably by a streptococcus, and I had her investigated from that standpoint. She had slight marginal gingivitis, and that might have been the source of the infection. Streptococci were grown from the stools, the post-nasal space and the gum, and a vaccine made and injected at intervals into the patient. Nothing happened after the first few doses, but after the fourth the condition reacted violently and became worse; but subsequently cleared up entirely and patient led a normal life for two months. The leg condition then returned and she had several more doses of stock vaccine, but with no good effect. I therefore think my original idea was not correct. Dr. Dore regards it as a vasomotor condition, therefore she has had galvanism and various other remedies. Before I saw the patient she had been taking thyroid extract and calcium lactate for a year, with no beneficial result.

DISCUSSION.

Dr. H. MACCORMAC said a number of similar cases with an erythematous patch on one or both legs, which might persist for months, or even years, had come to his out-patient department. There were some subjective sensations, and occasionally there was improvement during the summer. He now had one such case in the ward, and the lower aspect of the erythema was limited by the position of the upper edge of the shoe. This had led him to wonder whether the prevailing type of thin stocking worn by girls in all kinds of weather had something to do with the condition.

Dr. H. W. BARBER said that in a patient with a similar condition he had found the clotting-time of the blood very considerably prolonged. She had improved on a mixed thyroid-parathyroid preparation by the mouth, and intramuscular injections of calcium chloride.

Dr. F. PARKES WEBER thought that this case should not be called erythromelalgia, and that Dr. MacCormac and Dr. Barber had suggested its correct grouping, namely, that it was an example of a circulatory condition, tending in the direction of "Bazin's disease."

Dr. J. M. H. MACLEOD agreed with Dr. Parkes Weber. He had a typical case of erythromelalgia in an oldish woman, who afterwards manifested mental symptoms; apparently it was due to arteriosclerosis affecting the brain. There was, in that case, much redness and intense pain. He agreed that it was a vasomotor condition in the present patient.

Dr. DORE (in reply) agreed that the condition was vasomotor but it was not worse in cold weather and for this reason he did not regard it as an ordinary stagnatory erythema. The bright red patches appeared when the limbs were in the dependent position and that was why he suggested that it might be allied to erythromelalgia. He did not think it was allied to Bazin's disease; there were no permanent deep-seated nodules and it was acutely painful.

Case of Fox-Fordyce Disease.

By H. W. BARBER, M.B.

THIS girl has what, I think, is an extremely rare condition, which was first described by Fox in 1902; cases have also been published by Fordyce, Brocq, Haase and others. Fordyce named it "chronic, itching, papular eruption of the axillæ and pubes," and was inclined to class it with simple lichenification, or the "névrodermite chronique circonscrite" of the French. I do not think it is of that nature, one reason being that the distribution is always the same, namely, in the axillæ, pubic region, and to some extent on the pre-sternal skin. Another point against its being simple lichenification is that the X-rays, even in big doses, have practically no effect on the eruption. The patient has now less itching, but I attribute that to the improvement in her general health rather than to the influence of the rays. Probably these patients secrete some irritant through the sweat glands. I have examined sections histologically, and have confirmed what Fordyce described, but this does not help one much as to the ætiology. She has had the eruption just over two years.

DISCUSSION.

Dr. G. PERNET said he had seen two or three cases of this type, but at an earlier stage, in young women, strictly limited to the axillæ and the pubic region. There was marked pruritus in these areas coming on paroxysmally, but without any obvious lesions. Was the condition in the case shown by Dr. Barber a complication of a precedent pruritic condition?

Dr. H. G. ADAMSON said he had seen a similar case in a young lady, aged 25. In each axilla, at the centre of the chest and on the pubes were patches made up of closely set, small, red, raised, apparently peri-follicular patches. There was much itching, and he had diagnosed "lichenification" or "lichen simplex chronicus" and had given two pastille doses of X-rays at one month's interval without any result. There was no sweating and no pustulation so that the lesions did not suggest a furunculosis or sycosis. They had some resemblance to closely set verrucæ planæ, but he had discarded that idea and had made no definite diagnosis.

Dr. F. PARKES WEBER suggested that these "Fox-Fordyce" cases might be allied to those of recurrent abscesses or inflammation in the axillary sweat-glands, which appeared every summer. There might be a low-grade infection, which became especially manifest in summer time, when the sweat glands were most physiologically active. In some people the microbic agent might be insufficient to form actual abscesses. Such cases as he mentioned had been described in Switzerland and elsewhere.

Dr. BARBER replied that the lichenification in these cases was almost entirely follicular. There was lymphocytic inflammatory infiltration round the pilo-sebaceous follicles and sweat glands. Most of the cases described, as far as he knew, were in women.

Case of ? Angioma Serpiginosum.

By E. G. GRAHAM LITTLE, M.D.

PATIENT is a boy, aged 12, whom I have only seen once, and the history is that this curious naevoid condition appeared on the right leg, in a linear distribution near the ankle. He had it at $2\frac{1}{2}$ years of age, and it has steadily progressed up the leg, and has reached the mid-thigh. The patches take the shape of punctate hemorrhagic spots. I thought it might be Schamberg's pigmentary disorder, but it is more correct, I think, to regard it as angioma serpiginosum. The punctate arrangement recalls the "cayenne-pepper spots" in Schamberg's original description. Otherwise the patient is healthy. There has been no family disease.

Dr. H. G. ADAMSON (President) said he was glad this case had been brought, as it had been suggested at a previous meeting that Schamberg's disease and angioma serpiginosum were the same disease. Clearly the case now shown was not one of Schamberg's disease, which was definitely a pigmentation. In this case there was no pigmentation but there were dilated blood-vessels, which could be pressed out, except at little points where a dilated papillary vessel had become encysted in the epidermis and converted into a granular detritus, such as occurred in "De Morgan's spots" and other forms of superficial angiomas.

Melanosis Cutis, with Melanotic Carcinoma.

By H. G. ADAMSON, M.D. (President).

THIS patient, Mrs. C. H., was referred to me by Dr. Arthur Lynch. There is present on the thenar eminence of the left thumb a roughly circular patch of pigmentation $1\frac{1}{2}$ in. in diameter. The pigmentation is dark brown, almost black, and it occupies the outer border of the patch, the more central part having become depigmented and pale in colour. The patch is not raised and there is no feeling of infiltration. It appeared sixteen years ago as a small black spot. Towards the palmar side of the pale area there is a raised dark brown projecting tumour about $\frac{1}{2}$ in. in diameter, which seems to be protruding through the epidermis. This first appeared twelve months ago. There is also an enlarged gland in the left axilla. On the right cheek is an ordinary brown pigmented mole, noticed since childhood, and in front of the right axilla a deep brown mole noticed since birth.

The patient's lesion is an example of what is probably a melanotic carcinoma, arising from a pigmented patch such as has been described by

Hutchinson¹ as "lentigo melanosis," and by Dubreuilh² as "mélanose circonscrite précancéreuse." It has been demonstrated by Dubreuilh and by Darier that these melanotic patches are identical in histological structure with ordinary pigmented moles. I ask for opinions as to treatment. The usual method in these cases is free surgical removal of the whole pigmented area, together with suspected glands, but as rapid general dissemination has been known to occur after this proceeding, Dubreuilh has recommended surgical removal and Darier removal by electrolysis of the malignant growth alone, and it has been stated that sometimes after this more limited operation there has been no further new growth and that the glandular enlargements have subsided.



Case of melanosis cutis with melanotic sarcoma. (1) Deeply pigmented patch with central part becoming depigmented. Sixteen years since first appeared as small black spot. No infiltration; not raised. (2) Raised black tumour, twelve months' duration, apparently protruding through hole in horny epidermis.

DISCUSSION.

Dr. GRAHAM LITTLE referred to a case, that of a man aged 70, who had a dark blue, mole-like pigmentation scattered about his forehead for some years. He said that nine months ago he had begun to develop a patch similar to that in the present case. It was removed, and recurred in the scar almost immediately. Then the patient came to the speaker, who took him to Mr. Warren Low for a surgical opinion. Mr. Low's strongly

¹ *Archives of Surg.*, 1892, iii, p. 319; v, 1894, p. p. 253 (col. plate).

² *Ann. de Derm. et Syph.*, 1912, 5 sér., iii, pp. 205-230.

expressed wish was to remove the whole pigmented area, but it was difficult to acquiesce in that proposal as the area was about $2\frac{1}{2}$ in. in extent, and new lesions were coming out rapidly, separated from the others by areas of normal skin. Dr. Little advised the man not to have them interfered with. A week or two ago when again seen, a growth had taken place in one of the patches, and it was a carcinomatous tumour, about the size of a walnut. That new growth he would have removed. He had seen a similar case in an elderly woman who at first had only one or two of the lesions, and ended up with fifty to sixty. She died of internal carcinoma four months after the spread commenced.

Dr. G. PERNET reminded the Section of a similar case which he had shown in a woman of melanotic naevo-carcinoma about the lobule of the right ear. The case was submitted to a surgeon, but he did not feel inclined to interfere with it. Radium was applied with apparent success.¹ He had also shown a case of melanotic carcinoma of the big toe originally. The toe had been amputated, and a very unusual recurrence of growths occurred on the front of the same leg (multiple infective lymphangio-endotheliomata).²

Dr. A. M. H. GRAY said that in view of the fact that the glands in the axilla were already enlarged the prognosis was very bad. He recommended massive doses of X-rays both to the primary growth and to the glands.

Dr. ADAMSON (President), in reply, said he did not regard these cases as very common; no case had been shown at the Section during the last ten years; it was comparatively rare for a mole to develop malignant characters. In reply to Dr. MacLeod, he could not from his own experience express an opinion as to whether these growths were ever sarcomatous, but Dubreuilh and Darier amongst others had demonstrated that although their melanotic growths arising from moles might closely simulate sarcoma, the character of the nucleus of the cells and their gradual transition from epithelial cells showed them to be epithelial and not mesoblastic in origin.

[*Postscript*.—Since this case was exhibited the gland in the axilla has been removed, and as this proved to be "melanotic" the whole of the pigmented area on the palm was excised. A report of the histological findings will be published.]

Rodent Ulcer of Unusual Type (Mixed Follicular Rodent and Superficial Epithelioma).

By GEORGE PERNET, M.D.

PATIENT, a male, aged 42, has had the trouble on the left ear three and a half years; it began on the edge of the lobule, and has gradually increased to the present condition. When first seen, there was a margin of narrow line ulceration, and in places follicular growths of a translucent kind with coursing vessels, reminding one of rodent ulcer. Ionization improved it a good deal, but, as it was "hanging fire," he had recently had radium applied, and that caused the reaction which you now see. A biopsy at the spreading border in front of the ear (before radium was applied) showed rodent appearances about the hair follicles with superficial epithelomatous changes and superficial cell-nests.

¹ *Proc. Roy. Soc. Med.*, 1918-19, xii (Sect. Derm.), pp. 11, 42; *Brit. Journ. Derm.*, 1918, xxx, p. 217, and 1919, xxxi, p. 108.

² *Proc. Roy. Soc. Med.*, 1919-20, xiii (Sect. Derm.), p. 17; *Brit. Journ. Derm.*, 1920, xxxii, p. 16.

Case of Sclerodermia.

By GEORGE PERNET, M.D.

PATIENT, a female, aged 31, has had this oblong sclerosed patch on the nape of the neck just to the right of the middle line and extending somewhat into the hair region for four months. She has been under treatment a month, and the condition is improving; she has been treated with massage and zinc ionization. There is also some dystrophy and transverse ridging of the nails. I do not know whether the same ætiological factor is responsible for both conditions. The two conditions may be only accidentally associated.

Case of Adenoma Sebaceum.

By S. E. DORE, M.D.

THIS boy, aged 6, has adenoma sebaceum of the Pringle type. There is vascular dilatation accompanying the sebaceous growths. It was noticed on one cheek at the age of 1 year, and similar lesions rapidly followed on the opposite side and on the nose and chin. The lesions are grouped about the nose, labial folds, lower parts of the cheeks and chin, and are stated to be gradually increasing in number. They vary from a pin's point to a pin's head in size, and are very slightly raised above the surface of the skin—except in one instance, there being a more elevated and larger flat growth as large as a pea in the centre of the right cheek. There is no evidence of mental deficiency, but he has had fits, which began at 3 months of age and lasted until he was a year old. He also had a flat growth on the right side of the chest, which I think is fibromatous. It is common to find molluscos growths about the iliac and the lumbar region in these cases.

Electrolysis is undoubtedly the best treatment, but in hospital practice this is difficult, and I should like to ask if X-rays have been found of benefit in these cases.

Case of Nodular Leprosy.

By H. W. BARBER, M.D.

THIS man was originally in the Army, and has served in India, Palestine, South Africa, and Egypt. In June, 1920, he joined the Irish Police, and two months later he noticed patches on his chest, which he regarded as ringworm. Four months after that he felt ill, and nodules began to appear round the elbows in July, 1921, and then on various parts of the body, including the face, legs, and thighs. He was discharged from the police, and was treated at a hospital with salvarsan injections. I took him into Guy's Hospital and excised two nodules, sections from which showed large numbers of Hansen's bacillus. He is now under Dr. Graham Little, at St. Mary's, and is, I understand, being treated with a vaccine prepared from the nodules. Dr. Winkelried Williams has shown a case in which a vaccine apparently yielded good results.

Case of Leprosy.

By HALDIN DAVIS, F.R.C.S.

THIS case of leprosy is interesting from two points of view. In the first place it is remarkable for the prolonged incubation period. The patient, a woman, aged 68, is a native of Riga—a district well known as a home of leprosy—but she left that city twenty-two years ago, and has since lived in England and also in Philadelphia, where it is very improbable that she can have contracted this disease. Nevertheless, it only made its appearance for the first time about six months ago, so that it must be assumed that it has been latent in the system ever since she left Russia. In the second place the case is interesting for the resemblance which the clinical lesions present to mycosis fungoides. The flat areas of infiltrated skin present on the forearms and shoulders, spreading in circinate figures and enclosing within them islands of apparently normal skin are exactly like the lesions of mycosis fungoides; and when I first saw the patient I thought she was suffering from that disease. She has, however, other signs of leprosy consisting in thickening of the ulnar nerves, loss of eyebrows, and areas of anaesthesia, and the diagnosis has been placed beyond any doubt by the sections which Dr. Nabarro has prepared, which show the typical structure of leprous nodules and large numbers of *lepra bacilli*.

DISCUSSION.

Dr. F. PARKES WEBER said that some years ago he showed before the Section¹ a case of leg eruption, and no one suggested that it was leprosy. Some time later the patient had a disease of the conjunctiva, which the oculist thought was of a kind seen only in the subjects of leprosy. The leg lesions were then found to be swarming with leprosy bacilli.² That patient was a Russian-Hebrew, but he had been in England two years before the cutaneous affection was first noticed.

Dr. MACLEOD said no one had yet grown the leprosy bacillus, and until that had been done it seemed idle to talk about vaccines for the disease. Deycke grew a streptothrix, but it was found that the bacteriolysis, which was supposed to be produced by nastin, was equally well produced by benzoyl chloride.

Bullous Ichthyosis.

By W. J. O'DONOVAN, M.D.

W. S., FEMALE, aged 1 year 11 months, was born at full time; the family history gives no record of any skin affection. There were no spots on this child at birth but on the second day crops of blisters appeared and have continued to do so at frequent irregular intervals. When I first saw this patient at the London Hospital in September, 1921, only an impetiginous condition was noted. Under treatment the scales disappeared and thick patches of epidermis or bare areas of burst blisters were visible. Temporary improvement followed a week's rubbing with mercury ointment, then after a $\frac{1}{4}$ pastille dose of X-rays all over the eruption cleared up entirely. A month later (on April 6, 1922) the child was readmitted, now presenting a tylotic

¹ F. Parkes Weber, *Proc. Roy. Soc. Med.*, 1917, x (Sect. Derm.), p. 164.

² F. Parkes Weber, *ibid.*, 1920, xiii, p. 12.

condition of its hands and feet and a marked hyperkeratosis over its elbows, knees and neck. Over the abdomen, there are segmented-like bands of cross-hatched thickened epidermis. The differential blood count is natural; the Wassermann reaction is negative; there is no adenopathy. An injection of milk produced a marked local reaction but the complete exclusion of milk and milk products from the child's dietary produced no alleviation. Dr. George Pernet described a very similar condition in the *British Journal of Dermatology*, in November, 1911.¹

Dr. ADAMSON (President) said he thought this was a case of linear naevus. These multiple streaks often appeared months, even years, after birth, and sometimes they were not noticeable until 5 or 6 years of age. It seemed to him that the blisters occurred only upon the areas of linear naevus and not upon the rest of the skin. He did not regard it as a case of epidermolysis bullosa associated with linear naevus, but as a warty linear naevus with bullous formation at the site of the naevus.

Case of Tar Acne.

By W. J. O'DONOVAN, M.D.

THIS man now aged 43, first worked in the tar industry when he was 17, and handled tar, creasote and pitch for a period of nineteen years. Since leaving this work seven years ago his condition has not improved. His back is almost a carapace of acne scars, comedones and multitudes of small areas of indolent inflammation. In the gluteal cleft are abscesses for which he has sought medical aid. He has no telangiectases and no warts; his face is darkly pigmented. A photograph of his face appears in Dr. Sequeira's "Diseases of the Skin," 3rd ed., 1919, p. 89.

Case of Folliculitis Decalvans.

By E. G. GRAHAM LITTLE, M.D.

THE patient is a middle-aged nurse, who gives the history that the loss of hair commenced only six months ago. At the present time there is loss of hair with cicatricial atrophy over about half of the frontal area of the scalp. There are numerous still active peri-follicular pustules.

Case of Recurring Stomatitis.

By A. M. H. GRAY, C.B.E., M.D.

I SHOWED this case (patient a male, aged 35) a few months ago²; it was recurrent stomatitis, for which no cause could be found; it had been present four years. In the discussion, Dr. Pernet suggested it might be erythema iris, and during the last few weeks the patient has developed typical erythema iris lesions on the hands.

¹ Pernet, "Bullous Ichthyosis," *Brit. Journ. Derm.*, 1911, xxiii, p. 344, with full bibliography.

² *Proceedings*, 1921, xv, p. 4.

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Section of Electro-Therapeutics.

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PRESIDENT'S ADDRESS:

The Importance of Physics, Anatomy and Physiology, for the Practice and Progress of Electricity and Radiology.

By E. P. CUMBERBATCH, M.D. (President).

THE importance of physics in electrology and radiology is realized and its realization has been followed by action. Physicists have been appointed to the departments which deal with these subjects in some of the hospitals. The physics of electricity and radiation, and electro-technics are compulsory parts of the examination for the Diploma in Medical Radiology and Electrology instituted by the University of Cambridge.

One example will illustrate the way in which failure to recognize a simple principle in physics may lead to confusion in treatment. Cases of painful neuritis are sometimes treated by passing the galvanic current through the limb containing the inflamed nerve trunk under the impression that the current flows along the nerve. Some observers will get good results with this treatment, others will fail. In this way teaching of two different kinds may originate. But since the current has several paths in which it may distribute itself in its course, an infinitesimally small amount will pass along the nerve, since physics teaches us that the amount of current which passes through each of the various conductors is inversely proportional to the resistance of each. A nerve trunk forms a very small proportion of the cross sectional area of a limb, and its resistance, as a tissue, is much higher than that of the surrounding tissues. The good results when obtained are due to the action of the current on some other part of the limb. By keeping in mind the physical principle referred to above, a source of fallacy will be avoided, and further inquiries can be made on surer grounds. Again, some will treat the same condition by passing the diathermy current along the limb with the hope of heating the nerve trunk. But before we can expect to discover truth in this direction, we must be sure of the distribution of high-frequency alternating currents along electrolytic conductors. So far as I am aware, this is not known for a certainty, and we must look to the physicist to provide us with information and tell us the path taken by these currents in the human body.

The importance of anatomy in radiology is sufficiently evident. It is well illustrated in a paper by Thurstan Holland which appeared in the *Journal of Anatomy*, and was reprinted in the *Archives of Radiology and Electrology* for September, 1921, p. 105, on the rarer ossifications seen during X-ray examinations. Failure to recognize these, as well as sesamoid bones which are less rare, would lead to incorrect reports. Adequate knowledge of anatomy is equally important in electrology; it would be superfluous to say so, were not

certain mistakes known to occur. I have known the trapezius reported as showing normal reactions, whereas it really did not react at all, and the movements which had been mistaken for those of this muscle were actually those of the underlying muscles.

On the relationship between electrology and physiology I wish, however, to speak more fully. Electricity has been used in medicine for nearly two hundred years, but only at the beginning of the present century did it commence to progress and establish its value and obtain recognition as a valuable agent in therapeutics. The reason for the great advance in medical electrology was the realization of the chemical and physical changes which electricity could produce in the tissues, and the recognition that the therapeutic results were the direct or indirect consequence of these changes. In some instances the chain connecting these chemical or physical changes and the therapeutic result is short and each link is evident. In many others the chain is of unknown length and the links are obscure, and I feel sure that by the application of physiological knowledge and further physiological research much more light will be thrown on the problems that confront the electrologist, and further advancement made in medical electricity. It is surely evident that the physiological effects of electricity on the normal body should be established if we desire a scientific and accurate guide to the application of electricity in the treatment of disease, just as in pharmacology we learn the action of drugs on the normal body before we apply them scientifically and not empirically to the diseased subject.

I will now give some instances showing the help that may be derived from physiology in the elucidation of difficulties and the establishment of truth. The first is the treatment of paralysis by electrical methods.

The late Dr. Lewis Jones, the most distinguished medical electrologist which England has produced and an able neurologist, said, in his work on "Medical Electricity:" "It is perhaps hardly necessary to debate the question whether electricity is of use in the treatment of paralysis. But if there are any persons who still dispute the efficacy of electricity, and try to maintain the proposition that the recovery from paralysis is due solely to natural causes and is quite independent of any electricity which may be used during the course of recovery, the following case may be quoted."¹ He then described two convincing cases, and said: "For those who are not unwilling to be convinced, these cases seem to offer satisfactory evidence that the electrical treatment played an important part in curing the paralysis, and answer the objection mentioned above, an objection which is not always easy to meet, because for obvious reasons, it is difficult to combat it by direct proof."

There are others, and their numbers include many who are not electrologists, who believe that electricity has a use in the treatment of paralysis, and one only, that of making the paralysed muscles contract, thereby exercising them artificially, until voluntary power returns.

There are yet others, and I cannot believe that there are electrologists among them, who think that electricity is not of the least value in the treatment of paralysis, and some of them actually teach this view. I cannot understand how such a general conclusion was reached. I presume that the promoters of this doctrine know the kind of electrical treatment which is given, how frequently it is given, and whether it is given for a long enough period and in accordance with recognized principles.

¹ "Medical Electricity," 8th ed., 1920, p. 377.

Dr. Lewis Jones was sure of his ground and those who knew him are aware that he was a careful worker, cautious as well as accurate, and would not make claims he could not justify. In the above quoted passages, he says it is difficult to combat the objection to electrical treatment by *direct proof*. The disbelievers have not combated it by *direct disproof*. If the believers have not produced any certain proof, the disbelievers have not produced any certain disproof. But if the latter *teach* that electricity has no value in paralysis they are doing actual harm, retarding progress and discouraging the search for such direct proof that will convince everyone. The course of the following two cases combats the view of the alleged uselessness of electricity. The first was that of a child whose left leg had been paralysed for six years as the result of poliomyelitis acquired when she was a year old. During this period she had worn a splint and had had massage. When she was first seen (by a colleague who was undertaking my work), she had no voluntary power below the knee. The treatment prescribed was the sinusoidal current to the legs in the Schnee bath. When I first saw her, some power had been regained in the peronei. During further treatment some power returned in the extensors of the toes and the peroneus tertius. The current used for treatment produced no contraction of the muscles.

The second case was that of a woman who had wrist-drop on both sides. The affected muscles showed R.D. The faradic current, which caused no contraction, was used for the treatment of one side, and the galvanic current, which caused contraction, was used for treatment of the other side. Now in this case the side treated by the faradic current was the first to show recovery. This case and that preceding show that, in these at any rate, it was not necessary to make the muscles contract. What, then, is the method of action of the electricity? Is it not reflex stimulation of the muscles and their motor nerve cells, by way of the peripheral sensory nerve endings in the skin?

We must look to the physiologist to provide us with experimental proof of what electricity can do in the treatment of palsy. D'Arsonval showed that when the body was stimulated by faradic currents or sinusoidal currents which were of insufficient strength to cause any muscular contraction, there was an increase in the production of heat and an augmentation of the respiratory quotient. Work on the denervated muscle has been done by Professor Langley and his colleagues. Those who were at the annual meeting of the British Medical Association at Cambridge (Section of Pharmacology and Therapeutics) will remember how Professor Langley described experiments the results of which showed that after the motor nerve of a muscle was divided; the muscle lost weight, even though it received treatment by massage or various electrical applications. These experiments are valuable and show that electrical stimulation of a denervated muscle will not prevent its wasting, but they do not show that electricity has no value in treatment of paralysis. An additional set of experiments in which the nerves were sutured, and electrical treatment continued until complete regeneration took place, would show what the final effect of the treatment would be.

Bayliss has shown that stimulation of the posterior roots of the lumbosacral plexus of animals is followed by vaso-dilatation in the lower limb. In the full-length bath treatment by the sinusoidal current which is given to the cases of poliomyelitis in the Electrical Department of St. Bartholomew's Hospital, the posterior nerve-roots are stimulated by way of the peripheral sensory nerve terminals in the skin and it is very likely that vaso-dilatation is

produced in the lower limbs. This treatment has the effect of removing cyanosis and chilblains from the affected parts, and these changes are the first noted.

I shall now speak on a very important branch of medical electrology. Some would regard it as the most important of all; indeed, it was regarded as important in the days when the larger number of physicians and surgeons looked on all forms of electrical treatment with scepticism. It is the use of electrical currents to provoke contraction of the muscles of patients as an aid to diagnosis. When we determine the electrical reactions of muscle and nerve, we are performing on the human subject the experiments which we conducted, or saw conducted, on animals in the physiological laboratory long ago. But if the study of medical electricity is commenced after qualification, and the practitioner begins to learn electro-diagnosis, his recollection of experimental physiology, if any, will, in most cases, be small. Yet, now, he is practising applied physiology, and a part of applied physiology which has a most important practical value. I will give an example showing how failure to remember a simple physiological experiment resulted in an erroneous report of the reactions of a certain case. The patient had a cold blue swollen hand, and a report of the reactions of the intrinsic muscles was required. These muscles contracted extremely sluggishly to the galvanic current and R.D. was reported. But the hand was afterwards raised to a normal temperature, and it was then found that the muscle reacted quite briskly. A normal faradic reaction was obtained whereas it had been missing during the first investigation. One of the experiments performed in physiology is the demonstration of the action of cold in greatly prolonging the contraction and relaxation of muscle. But it is very likely that the muscles in the legs of patients, cold and paralysed by poliomyelitis, would be reported as showing R.D., if the effect of cold in prolonging the contraction were not known.

The work of those who have to test reactions is often fraught with difficulties too well known to those who have had experience. The use of stimuli which are difficult to measure, the inability to place the testing electrodes in contact with the muscle or nerve, the fallacies that arise from variation of the resistance of the overlying skin, from slight alteration of the position of the electrodes and the pressure with which they are applied, the uncertainty as to whether the contraction is slow, or slow for the particular muscle tested—all these make the results of one observer vary from those of another, and the value of a report depends on the man who made it.

The way out of these difficulties must be shown by the physiologist. The distinguished French physiologist, Lapicque, has shown a method by which the above-mentioned difficulties and fallacies may be avoided. The time factor which he described, viz., the *chronaxie*, is obtained by this method and will therefore afford clearer and more accurate information on the condition of the paralysed muscle and nerve. In the original method of testing, introduced by Erb, unmeasured stimuli are used, and the nature of the contraction has to be judged by the eye alone. The condenser method which has been long used on the Continent, but more for original investigation than for the preparation of actual reports for the physician and surgeon, was introduced into England by Lewis Jones. In this method we use measured stimuli, and it is not necessary to judge the speed of the contraction, but the fallacies above mentioned are not wholly avoided. By the use of the *chronaximeter*, they are avoided, as well as errors arising from personal judgment. Dr. Adrian, now lecturer on physiology at Cambridge, has used this method for determining the reactions of the

paralysed muscles of the human subject. A paper which he contributed to the *Archives of Radiology and Electrotherapy* deserves profound study.

The determination of the chronaxie requires the use of rather elaborate apparatus and the expenditure of much time, but further progress in electro-diagnosis will undoubtedly be made by this method, devised by a physiologist. All work on the chronaxie should be kept in review by those wishing to be foremost in progress in electro-diagnosis. If a physiologist would make further investigations on the denervated muscle of man, the gain to medical electrology would be great.

As far as I am aware, the only occasions on which laboratory conditions are repeated on the living subject are those in which the nerve, exposed at operation, is stimulated by electrodes placed in direct contact with it. The induction coil current is used as the stimulus. The failure to obtain a contraction of the muscle supplied by a damaged nerve is not necessarily a proof that there is no continuity of nerve through the region of the injury. Some other current, such as the galvanic, should also be used during such investigations, and applied by means of unpolarizable electrodes. A communication was made to a journal in which it was claimed that the extra-polar currents which can be detected in the regions of the nerve outside the part traversed by the polarizing current would give evidence of the presence of continuous nerve fibres, even if the latter had lost their electrical excitability. Such evidence would be of much value to the surgeon who is undecided whether to divide and suture a nerve. But reference to physiological work shows that these extrapolar currents can be obtained in non-living models composed of a metal conducting core, surrounded by an electrolytic conductor. The above-mentioned claim therefore requires further substantiation by the repetition of the experiments on a nerve trunk, the excitability of which has been destroyed.

Again, so far as I am aware, no form of electrical stimulus has been devised which will excite the vaso-constrictor or vaso-dilator fibres in a mixed nerve of the human subject. The power to produce vaso-dilatation and vaso-constriction might be of great value in the treatment of those obstinate vascular conditions such as chilblain circulation and acro-cyanosis. Physiological experiments by Bowditch and Warren have shown that slowly repeated induction shocks excite the vaso-dilator fibres in the exposed sciatic nerve, while frequently repeated shocks stimulate the vaso-constrictor fibres. These experiments might be repeated on the human subject.

There is yet another department of electro-therapeutics in which there is much doubt and difference of opinion and little ascertained truth, namely the treatment of disease by the constant current. Leduc's investigations on the migration of ions have proved of the utmost value and constitute a landmark in the history of medical electricity. Most workers now believe that ions cannot be made to penetrate, from without, more deeply than a few millimetres, and there is no exact knowledge or experimental demonstration of the method of action of the constant current in the treatment of disease in parts which are beyond the range of penetration of ions introduced from the exterior. Doubtless the current possesses the power of relieving pain in many cases of neuritis of a deep-lying nerve, such as the sciatic, yet the mode of action of the current is not known with certainty, although there is much speculation and discussion about it. Physiological experiments show that profound alterations in the excitability of nerve can be produced by the constant current. Very much work has been done on this subject, and if the experiments were repeated on man, or on excised tissues under the same conditions

that are present when the current is applied to the body, that is, with the electrodes, not in direct contact with the nerve, but separated from it by a layer of conducting material, some valuable results might be obtained. The conditions known as katelectrotonus and anelectrotonus are doubtless due to alterations in the distribution of the ions in the nerve. It is possible that the ions of drugs possessing therapeutic properties might cause electrotonus of a different degree and more lasting. This condition might be produced in the peripheral sensory nerve endings in the skin of the region where the pain is referred. Although it is not possible, owing to the conditions under which we work when applying the current to the body, to apply the electrodes to the nerve and obtain an anode without an adjacent kathode, yet physiological experiment has shown that anelectrotonus quickly spreads to the kathode and, as it were, obliterates the katelectrotonus. Anelectrotonus, if sufficient, abolishes the conductivity of nerve, and it should be possible to produce this effect in the superficial nerve trunks of the human subject.

While the constant current is passing through the skin an erythema develops both under the anode and kathode, and it may become very intense under the kathode. Is this erythema produced by the action of the current on the peripheral vessels, or is it produced reflexly? Is it superficial or does it also extend deeply? These are questions, the answer to which must be provided by the physiologist, and when the truth is known, valuable aid will be afforded to the electrologist in treatment and diagnosis.

Many other instances could be given showing that physiological investigation and study might aid the advancement of medical electricity. High frequency currents are often used for the treatment of arteriosclerosis with high blood-pressure, and good results are often obtained, but the ways in which they are obtained are uncertain. Some workers obtain a lowering of the blood-pressure, others obtain a rise, others obtain no change in the pressure. Here, again, we need the investigation of the action of these currents on the circulation of normal subjects and animals by the physiologist as a guide to their use in disease.

In conclusion I would urge the student and practitioner of medical electrology to study works on physiology, especially those on the nervous system, in addition to books on electrology. This study will afford many suggestions for investigation on patients.

Section of Electro-Therapeutics.

President—Dr. E. P. CUMBERBATCH.

Experiences with the Potter-Bucky Diaphragm.

By GEOFFREY FILDES, M.B., D.M.R.E.

FOR the benefit of those who are unacquainted with the Potter-Bucky diaphragm, it should be understood that the function of this machine is purely that of cutting out secondary radiations, stimulated by the passage of X-rays through the body.

These secondary radiations, passing in all directions, have the effect of blurring the image reproduced on the sensitized medium, in much the same way that would occur should an ordinary plate, exposed to light in a camera, be at the same time affected by a very slight light leakage round the setting of the lens.

The method adopted in this diaphragm for cutting out these undesirable rays is briefly as follows: A large number of strips of thin sheet lead, roughly 2 ft. long by 1 cm. broad by 1 mm. thick, are placed side by side and longitudinally parallel with one another and at a distance apart of 2 mm. They are held apart by packing strips of some suitable non-opaque material such as soft wood. The whole of this formation is so curved as to form a segment of a circle of a 25 in. radius—the lead strips each forming the last centimetre of a radius. The patient is placed so as to lie in the concavity of the formation and the sensitized film is placed below it. The focal spot on the target of the tube is then placed above the patient at the centre of the circle, i.e., 25 in. above the diaphragm.

In actual practice it was found that very good skiagrams could be taken in this way, but each had the pattern of the grid superimposed upon it. To obviate this, the patient was supported a very short distance above the diaphragm and an arrangement was incorporated by which the grid, between patient and film, could be made to move at any desired speed. The action of the grid will thus be seen. All radiations travelling direct from the focal point of the tube radially will either pass through the spaces between the lead slats, or a small proportion will be absorbed by the lead slats themselves. The lead slats will not be shown upon the film as they are moving, but will cut out a certain percentage of the rays carrying the image, thus requiring a slight increase of the exposure to produce that image. Further, all the secondary radiations from the body tissue, not passing along the radii of the circle will impinge upon the lead slats laterally and will be absorbed. This gives an outline of the principle upon which the machine works.

8 Fildes: *Experiences with the Potter-Bucky Diaphragm*

In practice it was said to be necessary to multiply the normal exposure by at least four, working with "Dupli-Tized" films and double accelerating screens. For the first six weeks during which the machine was in use the most disappointing results were obtained. In almost every case the negative was grey and the contrast was exceedingly poor, while no detail such as one had been led to expect was visible. The makers' suggestion as to tube condition was most carefully carried out, and both high and low milliamperages were tried. At this juncture Dr. Evans, of Detroit, who was visiting this country, called to see the Department, and, on our explaining to him the difficulties we encountered, he at once suggested that the speed of traverse of the diaphragm was too slow and that too much of what may be called the primary radiation was being absorbed by the lead slats.



FIG. 1.

The technique was at once altered and the normal exposure was broken up into not less than three parts, each part consisting of one rapid traverse of the diaphragm. Thus, where we had given one exposure of, say, twelve seconds for a lumbar spine and achieved only poor results, we now gave four exposures of two seconds each, the diaphragm traversing its full movement during each two seconds. At once the resulting negatives began to show extremely good detail, and by further small alterations in the technique the results came to be universally good.

Later on another machine was obtained, in which there were double the number of lead slats of half the thickness and half the distance apart, i.e., 0.5 mm. thick and 1 mm. apart. This machine has been found to give the best results in single exposures. The single exposure is better from the fact that,

where one has to load the controlling spring several times during the taking of a skiagram, there is a tendency to move the whole machine very slightly, thereby spoiling the fine detail.

As regards the tube condition necessary to obtain the best results, the makers state that the equivalent air gap between points should be 5 in. This applies to a Coolidge tube. When a gas tube is used an equivalent gap of $3\frac{1}{2}$ to $4\frac{1}{2}$ in. gives the best result, according to the part it is desired to show up. The fine focus Coolidge with a radiator, and limited to an input of 30 ma., gives the best detail.

With regard to the subjects for which this diaphragm is of greatest use, all deep bone structures are of primary consideration. It has been possible to obtain perfect detail of the internal structure of the bodies of lumbar vertebræ

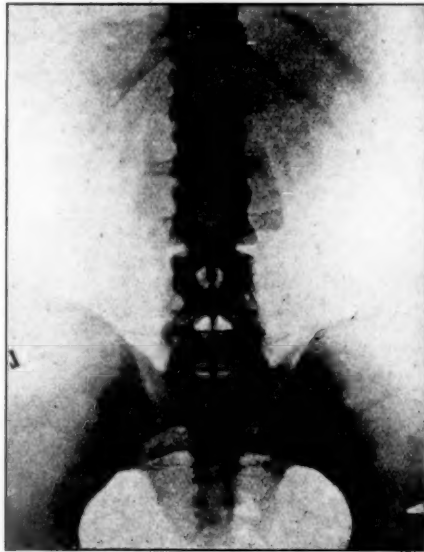


FIG. 2.

in full-sized adults. Hip joints can be taken in the same way, and one great advantage is that both hips, pelvis and lumbar spine can be shown with equally good definition on one large film. Kidneys present some difficulty as to compression, but with an adjustable broad band, beneath which two spun aluminium compressors can be inserted and then tightened to the necessary degree, almost perfect skiagrams can be obtained. The accompanying illustration (fig. 1) shows well the detail obtained of both spine and kidneys, while that of the normal spine alone (fig. 2) shows to what an extent soft tissues can be excluded when desired. The examination in the prone position for gall-stones is perfectly simple, and where the stones have a sufficiently opaque coating to be seen at all, they can be demonstrated with startling clarity.

10 Fildes: *Experiences with the Potter-Bucky Diaphragm*

In conclusion, it may be pointed out that, though good radiograms of these structures may be taken by the exercise of great care in the ordinary way, there will always be a heavy wastage of material to obtain a percentage of good results. The use of the Potter-Bucky diaphragm, once the technique is mastered, gives the most brilliant results with a wastage of less than 1 per cent.

Section of Electro-Therapeutics.

President—Dr. E. P. CUMBERBATCH.

Histological Pictures representing the Cure of Uterine Baso-cellular Epithelioma.

By Dr. FRANS DAELS (Ghent).

(ABSTRACT.)

[The paper will appear *in extenso* in the *Archives of Radiology and Electrotherapy*.]

IN introducing the subject, I would remind you of what has been written relating to histological changes of malignant tumours after irradiation. I first show you a picture of typical cubical celled epithelioma of the breast before treatment (after Wickham and Degrais, high and low magnification), and the same tumour sixteen days after exposure to a radium-irradiation at a depth of 2 cm. The phenomena of vacuolization of the malignant tissue and sclerosis of the connective tissue are distinct. Under high magnification we see the lymphoid infiltration and the pycnosis of the nuclei.

In an epithelioma of the nose, according to Perthes, twenty-five days after X-ray irradiation, a histological picture of regression in the shape of vacuolization and infiltration was visible. Seven days after X-ray irradiation of a cancer metastasis, arising in the skin of the breast from carcinoma mammæ, Perthes saw distinct phenomena of vacuolization of cancer-cells, which I now show you here, and seventeen days after the same irradiation the cancer alveoli were reduced to a few degenerating cells.

An adenocarcinoma uteri, according to Gausz, gave the following picture ten weeks after mesotherapy irradiation; the phenomena of vacuolization, pycnosis, formation of giant nuclei, and the development of connective tissue predominated, and three weeks later only a few remains of cancer tissue, lying in dead tissues, could be recognized.

Gausz treated with X-rays a recurrence of cervical cancer in the abdominal operation scar, and four weeks later he observed the following histological picture: Pycnosis of the nuclei, karyorrhexis, formation of giant nuclei, and the development of connective tissues are again the predominating features. After seven weeks he found only this small alveolus, which he considered to be the last remnant of cancer, but which, in the light of our knowledge, must be considered as the starting point of a recurrence.

Histological studies tend to show that the action of the X-rays and of the radio-active substances upon the baso-cellular epithelioma are identical. The baso-cellular epithelioma is the most frequent form of uterine cancer, and it consists of full alveoli or bands of epithelial cells without any clearly marked differentiation. The researches show that after a latent period of from ten to

fifteen days hypertrophy of the protoplasm and of the nucleus of the cancer cells appears, malformation of the nuclei, eosinophilia of the protoplasm and abnormal phenomena of keratinization follow. After that period there can be observed a vacuolization of the protoplasm and of the nucleus, achromatosis, or pycnosis, karyolysis, or karyorrhexis, accompanied by an infiltration of polynuclear leucocytes, phagocytosis of the degenerating cells, a more or less strong reaction of the connective tissue and endarteritis (Audin, Barthélemy, Darier, Kibbe, Peutrier, Pierre Marie, Menétrier, Clunet, Perthes, Gausz, Dominici and Rubens Duval, Delbet and Herrenschildt, Wickham, Degrais and Gausz, Krönig, Döderlein, Brunn, and others).

The great majority of writers think that the giant nuclei and the giant cells are formed by abnormal and incomplete mitosis; Handley, Klein, and Dürck attach importance to fusions of cells; Klein and Dürck attribute the formation of "conglutination giant cells" to the pressure of the sclerosed connective tissue upon the neoplastic cells. A well-defined action on the part of the various alpha-, beta-, and gamma-rays could not be demonstrated. The intensity of the irradiation is of the utmost importance.

The certainty of clinical and anatomico-pathological cure of malignant tumours as resulting from irradiation was demonstrated first by Dominici, and then by Wickham and Degrais. All the authors writing on the subject agree in concluding that various kinds of tumour can behave in quite different ways under the irradiation; some of them are absolutely refractory to their action.

The study of the histological phenomena of the processes of cure is important, both from the general point of view of the healing mechanism and pharmacodynamic influence of the irradiation, and also from that of the prognosis as to the action of radiation before and during a definite treatment.

In order to proceed methodically we have first studied the changes set up by the irradiation in a definite form and a definite localization of a malignant tumour, namely, in selected cases of uterine baso-cellular epithelioma.

Uterine baso-cellular epithelioma is easily accessible to irradiation with radium tubes, to curettage for diagnosis and control, and to removal by the vagina. The baso-cellular epithelioma is not much differentiated, and consequently sensitive to irradiation without complicated phenomena of cell-differentiation.

We used for our irradiations two radium tubes of 50 mgr. of crystallized radium bromide—one in a silver case and a brass case 0.01 mm. thick, the other one in a platinum case coated with lead 1 to 4 mm. thick—they were always wrapped with a thick covering of india-rubber and blotting paper. We followed the technique elaborated by our assistant, Dr. De Backer, for the radium irradiation of the uterus, the vagina, the rectum and the bladder, and the simultaneous employment of X-rays applied to the sacro-sciatic and the oval foramina. The evidence obtained from photomicrographs taken at this stage is important. We confine the description of our observations and their interpretation only to what is strictly necessary. I shall only demonstrate to you the typical modifications of the malignant tissue after irradiation as we have observed them. I shall not mention in this first paper the particulars of our technique of radiation, because the details of this technique are still in a state of evolution.

[Dr. Daels here described six cases of inoperable malignant disease of the uterus, demonstrating on the epidiascope the histological changes following the application of radium bromide.]

CONCLUSIONS.

In proportion to the intensity of the action of the irradiation upon the cancer cells of the uterine baso-cellular epithelioma, we observe the following phenomena. They are changes not met with in cases of spontaneous degeneration, namely:—

(1) Massive and rapid karyorrhexis of the cancer cells without any intervention on the part of the blood cells or any profound degeneration of the normal tissues.

(2) Progressive necrosis occasioned by pycnosis or achromatosis, with eosinophilia or vacuolization of the protoplasm and phagocytosis by polynuclear blood cells; this destroys quite a large number of alveoli; this well-marked phenomenon is here specially characteristic of the action of the irradiation.

(3) The transformation of the cancer cells into giant cells and giant nuclei,—an alteration that may lead to necrosis with invasion by polynuclear leucocytes, or to a gradual atrophy with fatty degeneration of the protoplasm and disappearance of those elements without any participation of leucocytes in the process.

The action exercised by the irradiation—radium irradiation more especially, but however not exclusively, since we often added irradiation by X-rays after radium treatment—first affects the nucleus and sets up an actual rupture of the nucleus comparable to the action of the irradiation upon the lymphocytes: or else a destruction of the nucleus, sometimes combined with eosinophilia or the megakaryocytic-shaped degeneration which seems to result from nuclear fusions due to loss of karyokinetic power.

Our observations lead us to admit that the polynuclear leucocytes only occur in association with spontaneous degenerations or with radio-therapeutic transformation of the baso-cellular epithelioma, as a consequence of incidental infections or the necrosis of cancer cells, and that they do not take an active part in the elective regression proper. And so we must also admit that the connective tissue has no active participation in the regression proper, as we meet with the most excellent definition of regression in the midst of the empty space remaining after the disappearance of the cancer cells. On the other hand, it seems that a special significance of effective reaction against the cancer proliferation or its agent must be ascribed to infiltration of leucocytes.

(4) The appearance of giant cells without the characteristics of malignant tissue, sometimes with a distinct follicle shape, the appearance of true histological follicles as a consequence of radium irradiation of cancer alveoli, lead us to the adoption of the hypothesis of the liberation of a germ or agent to which the body is supposed to react by lymphocytic infiltration and formation of giant cells. The observation should be connected with the two different sarcomatous and follicular reactions of the body upon the bacillus of Koch. The histological appearances found upon the healing of the follicle that arises after experimental injection of killed Koch bacilli should be remembered in this connexion, namely, formation of giant cells, fusions of the nuclei, formation of megakaryocytic elements, progressive liberation and atrophy of those megakaryocytes. These phenomena have the greatest resemblance to those observed in the case of cancer regression.

The Radiation of the True Pelvis with the help of Drainage Tubes.

By Dr. FRANS DAELS (Ghent).

[This Paper will also appear, illustrated with diagrams, in the *Archives of Radiology and Electrotherapy*.]

IN a lecture delivered at the Flemish Congress of Medicine at Antwerp in 1919, I discussed one of our fundamental principles of radium therapeutics, namely, the backward irradiation of tumours, that is to say by way of their basis of insertion and of propagation through the lymphatic system. I demonstrated the application of this principle in the treatment of inoperable cancer of the breast by placing radium tubes behind the tumours.

In a communication made to the "Académie de Médecine de Belgique" last June (1921) I described in detail our first attempts at radiation of the true pelvis upon such principles. At the "Congress of Obstetrics" of Paris in September of this year (1921), I was able to describe an advance in technique, and reported a first series. A wider experience since then has enabled me to simplify the method of treatment, details of which will now be given.

The true pelvis is the seat of numerous kinds of malignant tumour, glandular metastasis of which rarely takes place. Extensive removal by operation of these tumours is sometimes dangerous, and when successful is no guarantee of a radical cure. This is equally the case with cancer of the cervix uteri, cancer of the vagina, highly situated cancers of the rectum, cancer of the prostate, cancer of the vesical floor, all the glandular metastases and all the inoperable tumours.

Surgical extirpation of cancer, more and more extensive, does not solve the problem. The public is not very much impressed by a slight increase in the percentage of radical cures, and is much more struck by a corresponding increase in the mortality after operation. The final result is, broadly speaking, a breakdown in the struggle against cancer, as patients still try to avoid all surgical treatment.

Anti-neoplastic vaccination is still in the stage of experiment. On the other hand, "Curie" therapy and X-ray therapy may lead to complete cure. Not only do these methods set up massive tissue-necrosis, but they also lead to selective regression of neoplastic tissues.

The X-ray can hardly reach the deep metastases; the decrease of the irradiation with the square of the distance and the necessity of reaching the deeply situated elements of new growth in a cross-fire of a series of X-ray bombardments render the techniques difficult.

The extent of tissue through which the X-rays must pass to reach the deep parts is of great thickness, and only a very small fraction of the absorbed irradiation is available for use. The action upon the blood is intense, and so is the alteration of the general condition.

In the irradiation-techniques of cervical cancer by Winz's method—which up to recently yielded the best results—the irradiation of the cervix can only be followed by that of one parametrium after an interval of six weeks, and the irradiation of the other parametrium can only be undertaken fourteen weeks after the beginning of the treatment. The fact that other German clinics have obtained only 28 per cent. of cures instead of the 90 per cent. obtained after three years by Winz emphasizes the difficulty of the technique.

"Curie" therapy by means of plates or radio-active tubes appears to develop a more selective action upon the neoplastic tissues, but this action is more localized as the intensity of the irradiation has become reduced, and its therapeutic action does not extend deeper than 3 cm. The application of radio-active needles or the insertion of emanation-tubes into the interior of the tumours ought to exercise a more extensive action, but no marked improvement appears to follow the application of this technique to the deeply-seated paths of extension by way of the lymphatic system.

In collaboration with Dr. De Backer, I have studied the effects of mixed irradiation of the true pelvis by means of X-rays applied by way of the abdominal, sacro-sciatic and ovarian routes, and by means of inserting radium tubes into the vagina, the uterus, the rectum and the bladder.

In the search for a more systematic guarantee of cure we applied to the true pelvis our principle of treatment, which consists in irradiating the malignant tumours backwards in the zone of their propagation and most dangerous proliferation, and also in bombarding the whole of the cancer tissue together with the glands in a cross-fire of rays. In the case of cancer of the cervix uteri the practical realization of this principle consisted in the insertion of radium tubes into the centre of the tumour, and into the connective tissues of the true pelvis, in the neighbourhood of the glands, and on both sides of the tumour.

A radium tube exercised a beneficial action in an area of 2 to 3 cm. With three different ways of irradiation in the true pelvis, the greatest diameters of which are 13 to 13½ cm., we may hope to reach our aim and to be able to free the true pelvis of all cancer-cells.

In order to ensure methodical radium-irradiation deep within the connective tissue of the true pelvis, it is necessary to place and keep the radium tube within well-defined regions. For this purpose we have conceived the idea of conducting india-rubber drains, containing radium tubes, through the pelvis, so as to establish what may be called radium-therapeutic drainage of the true pelvis.

The combination of this irradiation with irradiation through the surface of the body and through the natural cavities, must result in enabling us to develop a most useful method of "cross-fire" in the interior of the true pelvis.

We planned the method of radium-therapeutic drainage, following various courses, according to the lymphatic currents and the situation of the tumours that were to be irradiated; drainage from the iliac crest towards the sacro-iliac articulation, and outlet through the great sacro-sciatic foramen ligament and alongside the coccyx, or more forward just beneath the ischium, or higher up along the ischio-pubic branch, passing for the greater part above the levator ani; that is a drainage from the great sacro-sciatic foramen to the ischio-pubic branch.

The researches carried out by my assistant, Dr. De Bruyne, upon the cadaver, prove that these various routes are practicable in the treatment of rectal, vesical, and prostatic tumours. In some of his tracings now shown you can recognize the various courses taken by the drainage in the true pelvis.

Other researches made upon the cadaver by a second assistant, Dr. De Rom, prove that a gynaecological radium-therapeutic drainage is practicable when carried out correctly. Some of Dr. De Rom's tracings now shown demonstrate this. We have only recently begun to put this gynaecological radium-therapeutic drainage into practice, under very varied conditions.

What structures shall we irradiate in the depth of the true pelvis? More

especially the external and internal iliac glands and the lymphatic channels along the uterine arteries. Their size is shown on the tracing. They can only be reached imperfectly by X-rays or radium-rays from the surface of the body or from the natural cavities of the true pelvis.

What are our operative landmarks? The iliac crest, the psoas muscle, the iliac vessels, the sacro-iliac articulation, the sciatic spine and the ischium.

TECHNIQUE OF THE IRRADIATION.

To carry out the method the following are needed; (a) Rubber-gloves; (b) a bistoury to incise the skin and the aponeurosis; (c) an india-rubber drainage tube 10 to 12 cm. long containing one, two or three, radium tubes; and (d) a chain, the size of the links being 1 cm., and each link divided into two halves. The drainage tube is firmly attached to the chain by means of some stitches, and is sterilized at the same time with the instruments before introducing the radium tubes.

The chain which passes through the drainage tube is 80 cm. long; 25 to 30 cm. remain at one extremity of the drain and 30 to 40 cm. hang out at the other extremity. The longest end of the chain finishes in an eyelet. At the other end we fasten at the twentieth link a piece of thread in order that at any moment the distance of 10 cm. from the first radium tube may be recognized.

Further we need: a half circle, round in its section and hollow, 1 cm. in diameter, graduated on two sides in centimetres and half centimetres, and 40 cm. long. Its radius is 17 cm. long. The end of this half-circle is broader and stronger in order to give a better grip to the hand of the operator. Through this hollow half-circle we can slip a metal thread, which ends in a hook.

The insertion of the radium-drains is carried out in the following manner: Incision of the skin over a length of $1\frac{1}{2}$ to 2 cm., on the left and right side of the anus between the anus and the hindermost part of the ischium. The forefinger is brought through the opening into the fossa ischio-rectalis; the perirectal floor and the sciatic spine are felt by it; it penetrates between the iliac and coccygeal parts of the levator ani into the connective tissue of the parametrium. The finger can penetrate deeply into these tissues, but it can seldom reach as far as the sacro-iliac articulation.

We now slip the end of the half-circle along the inserted finger and so we measure the distance between the spine and the skin; 7—8—9—seldom 10 cm. We conduct the point of the half-circle through the two parts of the levator ani and push it further into the connective parametric tissue.

An assistant holds the instrument in position. Superior incision of the skin 2 cm. inwards to the anterior part of the iliac crest. With the bistoury or the curved scissors we penetrate the aponeurosis and the forefinger introduced passes over the iliac and psoas muscle until it reaches the great vessels, which are recognized by the arterial throb. The finger passes beneath the vessels until the sacro-iliac articulation is reached. With the free hand we conduct the half-circle already introduced into the parametrium till it reaches the sacro-iliac articulation. We read the figures from the half-circle in the place of the inferior incision, and so we know the length of its course into the true pelvis—9 to 10 cm., seldom more.

If we now push the half-circle behind the retiring finger as far as the superior incision and again read the figures at the level of the inferior incision, we know the distance from the sacro-iliac articulation to the skin: 8—9—10 cm.

We slip upwards through the circle the silver thread ending in a hook. On this hook we fix the eyelet of the chain, and so we conduct this chain through the circle. By pulling upon the silver thread or upon the chain itself we keep the drain steadily in position on the tube or in the opening of it. By a backward movement of the circle this is taken out of the body and the drain is left in the pelvis.

The rubber tube with the radium must be placed in such a manner that its superior extremity reaches over the linea innominata and its inferior extremity under the sciatic spine, in order not to give it the opportunity of remaining hooked at the moment it is moved further at a later date.

The eyelet of the chain that hangs out of the inferior incision is fastened to the upper end of the chain over the abdominal wall. Safety-pins are passed through the first free link at the upper and lower incision and so the chain with the drain is steadily maintained in its place. Safety-pins may be inserted at the point of distance to which the chain will have to be moved.

If this drain contains radium in its full length, it is then left in the same place for some hours and after that is at once removed through the inferior incision by pulling on the chain. If only a part of the rubber drain contains radium, it should be moved several times in order to irradiate the same level of the true pelvis. The required amount of displacement is easily ascertained by pulling on the chain, and accurately graduated by means of the links measuring 1 cm. and $\frac{1}{2}$ cm. The radium-tube remains in the area under irradiation for ten, fifteen or twenty-four hours according to the amount of filtration employed. The most suitable doses for irradiation should be determined by clinical experience.

After the removal of the drain the chains are left in place for from five to ten days. I here show a radiograph of large rubber drains inserted through the pelvis and a radiograph of chains lying in the pelvis.

As I already stated, our first series of cases were treated in rather different ways.

I shall not explain why careful experiments were made in various directions. It will be sufficient to explain why different methods of technique were abandoned. I am demonstrating the steps of the operation in the clinical picture. Only the insertion of the circle and the introduction of the thread on the left side, and the introduction of the thread in the circle and the removal of the circle on the right are in evidence. The remainder of the operation is out of sight owing to the fact that only the back of the surgeon is visible.

(My other film I regret has been held up by the customs.)

The introduction and insertion of a great rubber drain through the whole pelvis from the superior to the inferior incision has been abandoned on account of its occasioning excessive tissue-distension and necrosis.

If the drain be dipped in oil of camphor the india-rubber becomes lax and loses its power of resistance.

If we left the drain in the pelvis for two to three weeks for the purpose of twice irradiating the lymphatics, too abundant a suppuration was set up. Therefore in order to lessen the amount of this suppuration we now always insert the radium tubes at once in the drain so that the irradiation is begun as soon as the drain is placed in position.

At first we heavily irradiated the cervix cancer and after three to four weeks we took in hand the radium-therapeutic drainage of the pelvis as soon as the cancer wound was cleansed. I think that the passage of our graduated circle through the pelvic tissues may encounter difficulties due to tissue-change

consequent on the first irradiation. On the other hand irradiation of the cervix cancer, after the insertion of the radium tubes deep within the pelvis, accentuates the suppuration of the operative wounds.

The best course in my opinion is to carry out erosion of the cervix, irradiation of the cervix and radiation of the deeply situated lymphatics on both sides at the same time. If that cannot be done, it is preferable first to irradiate the cervix-crater and immediately afterwards to undertake radium therapeutic pelvic drainage.

A rise of temperature or a bad general state, even amounting to cachexia, are no contra-indications to the treatment.

We leave the chains in position for from five to eight days and allow the incisions to gape widely.

RESULTS.

I will now explain a new method of treatment. Properly I ought to give an account of all that has been attempted by this method, even of the very first and incomplete attempts. After these first attempts the method entered a state of systematic development and improvement. The results to be reported refer especially to that period. We are entering upon a third stage, that of an established technique and of a more accurate study of dosage.

Our very first attempts at inserting drains through the true pelvis and of careful but too weak irradiation of its deeply-situated tissues, were made in the following cases: (1) A case of widely extending and deeply infiltrating vaginal cancer (insertion of the radium tubes in the direction of the internal aspects of the crural vessels); (2) a case of widely extending pelvic recurrence after hysterectomy for cervix cancer; (3) two cachectic cases with wide cervical cancer-crater; (4) insertion of a radium tube in the deep tissues on one side only was carried out after a partial extirpation of an inoperable cervix cancer that had undergone irradiation.

It is superfluous to relate the details of these cases treated from May to October, 1920. No operative complication was encountered. The case in which the drains were placed on one side only has remained without recurrence for more than a year. The vaginal cancer was partially extirpated. A recurrence took place only ten months later: in the meantime the patient refused every treatment proposed, thinking that she was cured. One of the cachectic cases improved visibly for three months but died in the sixth month after the irradiation. There was no means of retracing the former course of the drains in the true pelvis. The other cachectic patient died a fortnight after the operation: the drains were placed too far forward and passed in front of the uterine artery.

From October, 1920, we have worked in a more systematic manner. Since that date, we have applied our new method in the treatment of twenty-two cases: (1) Three cases of recurrence after hysterectomy. One of the cases diagnosed as a lymphatic recurrence could not be examined histologically; (2) fifteen cases of cervix cancer, inoperable on account of wide extension into the parametria, into the vagina or into the bladder wall; (3) four operable cases of cervix cancer. In three of these cases we have carried out vaginal hysterectomy, twice at the time of insertion of the radium tubes, and in the remaining case several days before the irradiation of the deep tissues.

Immediate Operative Complications.—None up to now.

For the present, only a summary is given. Including the first five cases mentioned and the twenty-two cases of the second series, we have at present

twenty-seven patients in whom the radium tubes were inserted along the lymphatic paths of the true pelvis without any complication. It is only necessary to work slowly when we encounter the great vessels, the glands or sclerosed tissues. We never had any serious hæmorrhage, nor had we ever to ligature a vessel.

Post-operative Complications.—One patient died after a week from intestinal obstruction caused by a kink of the bowel in the operation scar after vaginal hysterectomy. The recovery of the two other patients irradiated and operated upon was tedious, so that we abandoned this simultaneous operative and radium-therapeutic treatment.

In the case of another patient, the irradiation lasted on each side at three different levels, twelve, sixteen and seventeen hours, with 50 mgr. radium bromide, filtration through $\frac{1}{2}$ mm. of brass or platinum and 1 mm. of lead, plus the rubber drain. On the fifth day the temperature was 37° C. and the general state excellent; we thought we were justified in suturing the two incisions. This was the only case in which we attempted it. Two days later the patient had violent rigors and a temperature of 40° C. We opened the wound immediately, some purulent matter escaped and the temperature fell to 37° C. The following day, at the moment of straining at stool, violent hæmorrhage set in, and this caused the death of the patient, notwithstanding the fact that we tamponed the passage of drainage. At the autopsy we did not trace the vessel from which the hæmorrhage had proceeded.

In the case of a third patient, aged 55, excessively weak but without any pathological changes in her urine, there was complete atony in the course of the drainage and of the incisions which were situated several centimetres from the radium tubes. She had a slight rise of temperature before the insertion of the radium tubes, and this rise continued after the irradiation until the death of the patient, six weeks later.

The operative mortality occasioned by the insertion of radium tubes into the deep pelvic tissues was thus three out of twenty-two cases, i.e., about 13 per cent.; but every scientific critic will admit that the first patient died from a complication of the vaginal hysterectomy and not of the radium-therapeutic drainage, and that the second patient died from a complication resulting from a too hasty suture of the incisions which never occurred after this. The post-operative mortality, really to be ascribed to the insertion of the radium tubes into the deeply-situated area of the pelvis according to our present technique would be one in nineteen, i.e., 5 per cent.

In one patient in whom a great parametric cancer-tumour arose from the right vaginal wall, the tumour disappeared completely; three months later, however, a wide fistula appeared between rectum and vagina. Whether in this case the fistula was caused by the necrosis and absorption of the tumour or by a radium ulcer we cannot tell at present. A second patient, in whom the tumour was distinctly bulging out into the rectum, now complains of a great pain in the rectum. A small temporary fistula between the bladder and vagina appeared in a patient after vaginal hysterectomy following irradiation, but it healed spontaneously.

The other post-operative complications were of no importance. In the case of three patients suffering from a wide cancer-crater, who had fever at the time of the radium-drainage, abscesses arose in the course of convalescence; they burst open through the upper and lower wounds; they were cured without any complication.

Small rises of the temperature usually take place during the irradiation of

the lymphatics and some days later; they, however, disappear in the course of the second week without any complications. Generally the upper wounds cicatrize in the course of the second week, the lower in the course of the third or fourth week.

In the case of a patient with extensive vaginal cervix cancer the lower wound remained moist for two months and at that place a stubborn eczema broke out. Three patients had slight transitory neuritic pains in the lower limbs; a patient who was brought to us in a cachectic state and with a fever of 40° C. (wide cancer crater) was so weak in the legs for a fortnight that she could hardly walk: afterwards she recovered completely.

Clinical Cancer Cures.—After eight to twelve weeks our patients are in a state of clinical recovery from cancer, even the widest cancer-craters closed and transformed into cicatrices. Up to now we can only enumerate three exceptions in which a greenish wound has persisted for four and six months; and now arises the question whether we are not confronted with cases of ulceration caused by radium. We do not venture to remove small pieces to diagnose them microscopically, as the ulcer is very flat and is situated in two patients on the floor of the bladder, in the third it is extending widely over the great blood-vessels.

At the present time after two years, the first cases of our second series of twenty-two cases which had been given up by several surgeons and were treated by us according to our first imperfect technique, remain clinically cured. Several of them were again irradiated through the abdomen and the vagina two months and also six months afterwards.

We confess in all sincerity that we are astonished at the simplicity of the techniques and the favourable course of the post-operative recoveries. In the last cases the twofold operation was carried out within ten to fifteen minutes and several of these patients left the wards after three or four weeks.

I think that the study of the details of the operative techniques is nearly exhausted; the study of the suitable radium doses, and, if necessary, of the radium-X-ray doses is at present our principal preoccupation.

At an informal meeting of the Section, held December 9, 1921, Dr. CARELLI (introduced by the President, Dr. CUMBERBATCH) gave a Demonstration and a Lecture on "Pneumo-peritoneum, and a New Method for (Radioscopic) Renal Investigation."

Dr. J. R. RIDDELL gave a description (with Demonstration) of "A Simple Apparatus for making Serial Radiographs of the Pyloric Region in the Horizontal and Upright Positions."

Section of Electro-Therapeutics.

President—Dr. E. P. CUMBERBATCH.

Electro-therapy in Gynæcology.

By Dr. A. ZIMMERN (Paris).

RECENTLY electricity in a great many of its applications has been somewhat neglected, especially in relation to gynæcology, which is surprising in view of the recent successes of this agent, for instance in the departments of dermatology and urology.

Good results are being obtained in the treatment of angioma, hypertrichosis and warts, with galvanic needles; and benefits from high-frequency current in the production of cicatricial tissue in cases of eczema and lupus. The electrolytic enlargement of the urethra is also well known and recently many urologists have discussed the use of the electric spark from the Oudin's resonator in destroying papilloma, or in cauterizing ulcerations of the bladder.

But in the speciality of diseases of women, the use of electricity, although of far earlier origin, seems to have been little emphasized since the days of Apostoli. Gynæcological treatises hardly refer to it, and to the majority of physicians it is most frequently a revelation when they hear that electricity is valuable in any particular department of gynæcology.

The main reason for this state of affairs is that gynæcology appears primarily to be a surgical fief. A woman in whom the family doctor has discovered a gynæcopathy runs immediately, with his assent, to a surgeon, and he is naturally, instinctively, incited to take in hand spoon or knife. A gynæcologist worthy of the name ought to be an operator, and I know a great number of those who cannot refrain from smiling at the expression "conservative gynæcology."

Moreover, this indifference to electrical treatment extends to other physical therapeutics; it is so with gynæcological massage, which is even more neglected than electricity. Such ostracism is based on the same grounds, and one wonders at the reliance which urologists place on electricity in the above-mentioned applications, as well as in massage, for expressing the prostate (methods which have become to-day quite classic), while similar requirements, such as galvanic enlargement of the cervical canal, or manual evacuation of the tubes, have not received the slightest professional sanction. Although gynæcological electricity has not the brilliancy of surgery, it is no less true that its general results (now tested by time) warrant the right to employ it.

It is remarkable that medical therapeutics has at all times been attempted in the treatment of *fibroids*. It was only superseded by surgery when the number of operative complications had decreased sufficiently to allow of the

exclusion of any other treatment which could not give such good results as surgery.

Thus Apostoli's method was wisely appreciated when the mortality of hysterectomy was still terrible. But in course of time it was employed for inoperable fibroids only. At present, in spite of the relative low mortality after operation, medical treatment now prevails again, in the form of X-rays. But that should not replace treatment by electricity, because there are cases in which the uterine galvanic sound has controlled hæmorrhages which could not be stopped either by X-ray or by radium application.

It must be remembered that, particularly in the case of heavy fibroids, when the hæmostatic power of the rays is deficient, the introduction of the galvanic carbon sound, with the application of 30-90 ma. positive pole for five minutes, twice a week, sometimes reduces or puts a stop to the hæmorrhage.

The success of electric treatment of *metritis* depends for the most part on correct diagnosis. It is indispensable to take into account a number of circumstances which are very difficult to enumerate. One case will benefit by positive electrolysis, another by negative, and another by ionic electrolysis; indeed, there is some difficulty in trying to outline routine treatment.

If we leave the acute varieties out of account we generally meet with two main groups of *metritis*. The first one comprises the infective form, met with in the chronic stage, where a previous infection of puerperal or gonococcic origin is undoubted. The second group embraces several pathological states, commonly called diathetic *metritis*, dystrophic *metritis* and uterine congestion. Among those types we must also distinguish virginal *metritis*, menopausal *metritis* and subinvolution.

It would be a mistake to treat a gonococcic chronic *metritis* like a virginal *metritis*. The problem consists, therefore, in the first place, in indicating as precisely as possible the real form of the *metritis*. Antecedent and present signs will usually supply us with valuable information. In the absence of a knowledge of the origin of the complications (miscarriage or *metritis*), or of events contemporary with their outbreak (inflammation of the appendages), valuable information may be derived from the character of leucorrhœal discharge and hæmorrhages.

It must be remembered that a glairy, colourless, and transparent liquid, differing only by its exaggerated abundance from the normal uterine secretion, indicates a congestive state of the uterus, as it happens usually in arthritic lymphatic girls, or young women, while a purulent or muco-purulent, yellow or greenish-yellow discharge is indicative of a genuine *metritis*. One must also bear in mind the differential characters of hæmorrhages, which in diathetic *metritis* are of the menorrhagic type, and take on an irregular course in the real *metritis*. Yet this last sign fails when the *metritis* is of old standing and therefore occupies still more of the cervix.

In those cases we have four methods at our disposal: (1) galvanic current with positive pole introduced into the uterus; (2) the same with negative pole; (3) ionic electrolysis; and (4) high-frequency current. The following are the indications for these various methods of treatment. Positive cauterization is preferred when the *metritis* is complicated by meno- or metrorrhagia. As the hæmorrhage generally results from a corporal *metritis*, it is an advantage to introduce a sound as deeply as possible, and this of a sufficient calibre to reach the greatest surface possible of the mucous wall. For this end carbon sounds of suitable size are the best. They answer a double purpose. If hæmorrhage results from paralysis of the musculature, according to the law of Stokes the

passage of the galvanic current will be sufficient to overcome the inertia of muscular fibres; if it depends on fungosities or ulcerations, the effect will be a caustic one, provided the sound chosen is bulky enough.

Intensity must be generally high, especially in the second case. It is permissible to use more than 40 ma. Apostoli recommended even higher intensities; he reached sometimes 100 and even more. But experience has shown me that a current of too high strength occasionally defeats its purpose; it may arouse or increase pain, and generally proves ineffectual.

It is a good precaution to begin with relative weak intensities; for instance, 20 ma. The accurate number of milliampères cannot be given, as a rule, because this depends on the sensitiveness of the patient, and also on the surface of the active part of the sound. The main principle is to employ in all cases only, that dose which is, as we say in French, *utérinement tolérable*, an expression which means supportable without immediate or consecutive pain.

It is frequently asked whether the speculum should be used or no. In the majority of cases it is preferable to do without it. With habit it becomes quite easy to direct the sound upward through the uterine canal by guiding its ascent with the fingers of the left hand introduced into the vagina. If you find some difficulty in pushing it beyond the cervix (this happens when you have a marked flexure), the right hand, which is free, can depress the fundus of the uterus, while an assistant pushes the sound slowly inward.

If it is intended to cauterize the uterine cavity, one must draw the sound slowly down during the passage of the current, so that it may get access to every part of the walls in succession. Generally, each position of the sound will be maintained for two minutes, so that a complete séance requires from five to ten minutes, according to the dimensions of the uterine cavity.

Results may be obtained sometimes after one séance only; more frequently, hæmorrhage resulting from metritis needs from five to fifteen séances. With regard to hæmorrhages, it may happen that in spite of the application of X-rays, of radium, or of the galvano-cautery, they cannot be stopped, or what is worse, one of these treatments involves a more-or less alarming increase of the flow. In such cases a superficial, submucous fibroid or a polypus is the probable cause of it. Obstinate hæmorrhage results in 90 per cent. of cases from this local cause, in consequence of which a patient must obviously and urgently be advised to undergo an operation.

If hæmorrhage is not the predominant symptom, and if at the same time the metritis is not too recent, and exhibits the features of the dystrophic variety, most remarkable effects may be expected with the application of the negative galvano-cautery and a medium strong current of fifteen, twenty or thirty milliampères. It must be recollected that these applications should always be harmless; their intensity must always be in proportion to the patient's sensitiveness.

After each séance the leucorrhœa becomes more abundant. On the other hand, if the secretion is thickish and opaque, it soon becomes ropy and clear. This reaction is most salutary. In that way we induce a hyper-secretion which produces a real drainage of the blind glands of the uterus.

Scraping, which never causes a complete removal of the mucous membrane, and always leaves the deepest parts buried in the muscles; lavage with antiseptic liquids, which do not penetrate beyond the surface, cannot be compared with our method by means of which we obtain a flooding of the infected humours from inside to outside.

Formerly we thought that it was necessary to apply galvano-cauterization to

the widest extent of the mucosa with a view to obtaining a new tissue, cicatricial and healthy, and this explains the lately recognized use of very high intensities. But, as has been noted by Fréderiq, it is absolutely useless to endeavour, with the carbon sound, to destroy more than very small regions of the endometrium. In consequence, this method unavoidably leaves in the uterus large infected areas always capable of harbouring the disease.

Now as, in spite of that, numerous women get well, it became necessary to abandon this explanation, and therefore I devised the hyper-secretion theory, which fits in with the physiological action of electricity upon external glands. Consequently, you may readily understand, that as we need not to disturb anything, slight intensities are sufficient. For the same reason we should select the negative pole, the more stimulating action of which upon the glands is universally well known.

Another method, which has given the most satisfactory results in the cases of which we are speaking, is the high-frequency current, or, more exactly, the little spark of the resonator. Unquestionably, the spark produces a fluxion and a hyper-secretion similar to the negative excitation of the galvanic current.

This application may be made with the electrode of my pupil Dr. Coltenot, here shown, which may be held by a handle of ebonite. The purpose of the insulating pearls is to keep the metal of the sound always at a distance from the walls and thus to allow the explosion of the spark.

Cervical metritis is generally of double origin. Sometimes the cause is a total metritis, which, in course of time, invades the cervix; sometimes it is a more or less chronic gonococcal metritis.

In the first case all that we have just said holds good, and one will have to choose between negative galvanization or high frequency; in the second we hold a first-rate weapon in silver ionization.

Silver seems to preserve in gonorrhœal subacute or chronic metritis the specific property it possesses in other local types of this infection (cystitis, conjunctivitis). And this is not only true of recent leucorrhœa, but also of the very chronic form, where no more Neisser's microbes are to be found, provided however that we may really be sure of a gonococcal origin.

The treatment is sometimes very brief and needs ordinarily but few séances. Relapse is always possible; but still here it is feasible, with a few applications, to bring about a satisfactory termination of the complaint.

The ionization should be done with a silver sound, and as silver ions move towards the negative pole, like every metal, the sound must be connected with the positive pole.

Intensity need not be higher than 20 ma. and the duration five or ten minutes, with two séances each week to begin with. In three or four weeks, in favourable cases, the patient may become convalescent. When the current has passed during the necessary time, you will know that it is impossible to extract the sound, for it has closely adhered to the tissues. To avoid lacerating them, it is only necessary to reverse the direction of the current for one or two minutes when using a low intensity. The softening effect of the negative pole will in this short time allow the sound to become disengaged. (Later we shall discuss another most important use of this remarkable property of the negative pole.)

First, I must be prepared to answer the objection which I foresee that you will not fail to make. What becomes of the tubes and ovaries? Do you take no care of them while you administer all these kinds of current? And do you not fear that these organs may be damaged?

It is an elementary rule, which we have no right to disregard, to consider as a most strict contra-indication the presence of any acute, subacute, or purulent inflammation of the appendages. When such a complication exists electricity becomes dangerous. It is certainly because they have disregarded this fundamental precept that gynecologists have had to deplore severe accidents.

As surgeons are no longer consulted by women who have been cured by electric treatment, but on the contrary attend them when something goes amiss, we may here find one of the main reasons which have brought disrepute upon electricity in gynecology.

In short, we must constantly watch the state on both sides of uterus. When increase of temperature is present, the adnexal inflammation should be previously treated by the classic methods, especially rest and very hot and frequent enemata. A like precaution ought to be taken, if, following a treatment, temperature, absent up to that time, begins all at once to increase. It is often the revelation that a subacute salpingitis is not utterly extinguished.

There is nothing to fear, on the contrary, when after the séance women make no complaint of violent pain, or when the thermometer does not show any increase of temperature.

Salpingitis almost always accompanies infective metritis: appendages seldom remain healthy when the uterus becomes infected. But when the acute stage is over all the pelvic organs often remain congested.

Congestion of tubes and ovaries is often wrongly diagnosed as salpingitis. If the Fallopian tubes in this state are capable of discharging, no complication need be feared. Aseptic congestion is no impediment to electric treatment.

Neuralgic pain of the pelvis will be discussed later in connexion with appendage disorders, but the possibility of dealing with this kind of trouble by the application of vaginal faradic or galvanic current is mentioned.

A large number of my patients who have asked me to treat them were women who have been suffering more or less at the approach of the menses. Text-books refer to two forms of dysmenorrhœa, the nervous and the obstructive.

The nervous form, still called essential—and this word hides our sheer ignorance of its cause—appears at present to be very seldom seen. Most frequently, thanks to conscientious inquiry and thorough exploration, we are able to discover the cause of dysmenorrhœa, and this is almost always an obstruction. Fibroid tumours, congestion of tubes, which diminish their opening, flexure of the uterus and cervix stricture are the principal anatomical reasons for dysmenorrhœal pain. The proof of this is supplied by the most encouraging results of the treatment. Thus, you know perfectly well that in the treatment with X-rays, when the cessation in growth or reduction in size of the fibroid tumour begins, menstrual pain decreases. Now, if you adopt an appropriate treatment for flexure, or for stricture, you may also expect a brilliant success. The important thing is to discriminate exactly the ætiological reason, which means, in other words, that an electro-therapist ought to be also a most skilled gynecologist.

In treatment of flexures, the method I have hardly ever found to fail is progressive straightening combined with electric stimulation. A tampon, well lubricated, is introduced every two days into the anterior or posterior cul-de-sac of the vagina, in such a way that it must be bulky enough to lift lightly the body of the uterus and support it without leaving its place. I much prefer this proceeding to the use of pessaries, because those usually injure the walls of the vagina, become rugose, and are difficult to keep clean.

The pledget, on the contrary, which may be changed as frequently as wished, which may be easily pulled out by a piece of string, and above all, the size of which may be progressively increased, seems to be the best agent for reposition. It will fail only in cases of adhesion, but I believe such failure rarely occurs. I must acknowledge I have never observed it. The progressive lifting should be associated with electrical treatment in order to increase the tonicity of muscles and muscular ligaments.

Logically, and on electro-physiological grounds, the galvanic current would be the only form suitable on account of the specific power of the galvanic wave (more protracted than the acute waves of faradic apparatus) upon the smooth muscular fibres. Nevertheless, with the faradic results seem to be as good as with continuous current.

The application is here made in the vagina. A carbon sound enveloped in a ball of absorbent cotton is introduced deep behind the uterus: the dispersing electrode is imposed as usual, upon the lower part of the abdomen. Intensity about 15 to 20 ma.; medium strength if the faradic current is preferred. Séances daily *ad libitum*.

Stricture of the cervix constitutes one of the most interesting departments of gynæcological electro-therapeutics. It may be congenital or adventitious. Deformities like conic cervix constitute the first type, vicious cicatrization, following tears during delivery, operations, amputations, cauterizations, the second type. In both cases, dysmenorrhœal pain may be the only symptom, but sometimes the clinical state appears more severe from retention of blood or muco-purulent flow. Medical treatment consists in progressive enlargement with the well known Hegar's bougies: this method, however, is generally followed only by transient good results. Surgeons have, therefore, devised several kinds of operation, for instance, Pozzi's stomatoplasty or the radical one of amputation of the cervix.

Carried out on the same principles as the electrolytic dilatation of strictures of the male urethra, the electrolytic treatment of strictures of the cervix, although not in equal repute, is an exceedingly reliable method. Its purpose is to render the cervical duct supple and wider without any disturbance merely by virtue of the resolutive property of the negative pole. This method is absolutely without danger, and adequate for every kind of stricture, congenital with rigid cervix, adventitious with cicatricial texture.

As alkaline secretions, which are produced near the negative pole, do not attack metals, it is a matter of indifference whether a platinum, nickel, or silver sound is used. As we are already in possession of a silver sound, the employment of which for metritis we have already mentioned, it will not be necessary to get another of the same size. Yet our instrumental armoury must be completed by series of other sounds of increasing diameter. I generally use nickel sounds, from 1 to 6 mm. Hegar's bougies, which are nickelled copper, if they are of the requisite dimensions, may also be employed.

For this application the speculum appears to be preferable; it is even sometimes indispensable, because the uterine aperture is too small to be felt with the finger. The size of this aperture having been noticed, the largest sound, whose volume yet allows of a free entrance, will be slowly and gently introduced into the canal. After protection of the external part of the instrument against contact with the speculum, through an insulating rubber tube, the current will be started and gradually increased to 6, 10, or 15 ma. It must be understood that strong intensities, which would produce a more or less deep cauterization, should be avoided, as weak currents alone can effect the desired resolution.

The sound must be left in place for a few minutes to allow the electrolytic effects to exert their action, two or three minutes on an average. Three or four days afterwards the same operation must be repeated, but with a higher number, that is, a larger sound, provided it is still able to penetrate easily by soft friction. A narrow canal will, in that way, admit by degrees instruments which it would have been impossible to introduce at the time of the first séance. The possibility of introduction into the cervix each time a sound of superior calibre is a remarkable tribute to the softening power of the negative pole.

Sometimes, even with the lowest number, with the sharpest sound, it becomes impossible to effect the catheterism. In such a case, of course very rare, and only observed in virginal forms of strictures, more particularly in uterine aplasia, or infantilism, this smallest sound will be held in contact with the external aperture of the uterus with a light pressure against it. If it is connected with the negative pole, the hand which holds the instrument feels later that it is slipping into the canal. As stated by Laphorn Smith, "it is really wonderful to see how easily a sound negatively charged may be thrust in the uterus, while one knows in advance that the same instrument without any current is unable to be forced in."

The enlargement needs a variable number of séances; it is evident that, on account of the several types of stricture, for instance, the far greater difficulty presented by very narrow and very hard cicatricial strictures, it is quite impossible to speak even of an average. As soon as the extent of the enlargement is realized, a new series of séances must be recommenced in order to prevent a fresh stenosis, and in order to consolidate the result obtained.

Negative electrolysis is of great value in amenorrhœa and sterility.

Amenorrhœa in young girls is often connected with a state of aplasia or infantilism. At other times we are begged by uneasy mothers to relieve their daughters, because, as they usually say, their flow does not seem to be "rich" enough. Sometimes, too, amenorrhœa, complete or partial, occurs in obese women who are approaching the period of menopause. In these cases we have to deal with ovarian insufficiency, easily recognizable by its other symptoms, such as headache, nervous depression, and, above all, by the characteristic flush of the face.

All this kind of trouble may be favourably influenced by use of the congestive action of negative electrolysis, and this will be effected by intra-uterine or intra-cervical appliances, with a galvanic current, 20 ma., for five minutes, two or three times during the week preceding the presumed time of menstruation.

This manner of action is the most energetic, but it is not always necessary to have recourse to uterine electrolysis in order to establish the menstrual flow. This should be reserved for obstinate cases. Ordinarily, we may be satisfied with the vaginal continuous current by means of a cotton tampon covering the carbon sound, or, perhaps, just as satisfactorily by excitation of the ovaries through the abdominal skin with moistened electrodes, the negative electrode being placed in front of each one successively, the positive on the lower part of the back.

Although electric treatment appears to be the most effective measure against amenorrhœa, it must not be forgotten that a trial of opotherapy, in form of ovarian extract, sometimes of thyroid, ought to be made simultaneously.

The artificial cessation of menstruation, which we endeavour to bring about by means of the X-ray in fibroid tumours, is readily induced by similar disturbances of the ovarian functions. Several authors, indeed, believe that their appearance signifies complete destruction of the ovarian epithelium—in

other words, of the external gland—and they declare that this event indicates the precise moment when X-ray application should be discontinued. But frequently it no less shows that a pronounced change has supervened, which is expressed by discomfort to the patients. I have relieved some of my patients of those pains in a few séances by means of the abdominal galvanic current used in the above-stated manner.

Uterine flexure and stricture are undoubtedly among the most frequent causes of female sterility. The above-mentioned methods are an effectual provision against this state. It is the greatest possible satisfaction to know that the application of these methods have rendered a hitherto un hoped-for pregnancy possible.

For the technical details, let me refer you to what I have said as to the method employed for reposition or enlargement of the uterus. But it must be recollected that those methods will only be successful when the tubes are healthy, or at least relatively so.

This needs explanation: If salpingitis is present, as we have already mentioned, the galvanic current is strictly contra-indicated.

So we have at first to treat the adnexal inflammation with classical measures (that is, rest and hot-water injections). If, however, there is only congestion of the tubes, if they are only moderately swollen, sensitive to the touch, without tendency to temperature, the probability is most often that it is a congestive state kept up by a sluggish evacuation. In such cases we are able to hasten the evacuation, and consequently to dissipate the congestion by daily applications of the faradic current. Therefore we shall have to introduce successively on both sides of the uterus our covered carbon sound. Intensity of the current must be moderate, weak enough not to give any pain to the patient. Duration: five or ten minutes each side. The other electrode, the dispersing one, must be, as usual, placed on the abdomen.

The most disconcerting contingency in gynæcological clinics arises from women who complain of continuous pain in the lower part of the abdomen, and in whom manual exploration remains unavailable. Every organ seems to be healthy, and, at most, there exists only a slight swelling of the tubes, which cannot be considered as sufficient to explain the acuteness of the pain.

In absence of anatomical lesions we are accustomed to speak of neuralgic pain, of pelvic neuralgias. Their persistency often leads such patients to surgeons, who believing the condition to be sclero-cystic ovaritis, resolutely undertake hysterectomy. I believe that before patients are driven to undergo that extremity a trial of electric treatment may be made, provided that one has at least some certainty as to the origin of the neuralgia. If this appears to be tubular congestion, we know now how to manage it. If not, there is the possibility of renal disease, of hip disease; or again, and more often so, of lumbar neuralgia, the pain radiating into the pelvis. For such cases I do not know of any electrical treatment, but, notwithstanding the interdiction of X-rays from the discussion it would be an omission not to mention the remarkable power of radicular radiotherapy. In fact, it is certain that one seeks too often in the pelvis a cause of illness which is of extra-pelvic origin. Like sciatica, or like brachial neuralgia, pelvic pain may be dependent on a diffuse lumbar neuralgia (irritation of the nerve-roots through vertebral arthritis or periostitis).

At times we are asked to attend patients after delivery. Sometimes it is for an obstinate flow of blood, at others for paralytic relaxation of tissues, the consequence of which is incontinence of urine or of the fæces.

This flow is connected with post-partum inertia of the uterus, which occurs either on account of retention or of a too rapid expulsion.

Scraping is the usual manner of treating those complications, above all when they are accompanied by fever; but sometimes more or less abundant hæmorrhage continues. In such cases one must not hesitate to substitute for the spoon the galvanic intra-uterine sound charged with an even, low current.

In one or two séances the muscular fibres of the uterus may recover their tonicity, and the lying-in woman may be left completely healed. This statement is based upon repeated personal experiences.

One word only about urethral paralysis with incontinence of urine and also of fæces. Here the usual method of practice, the faradic current with the rhythm properly controlled by the metronome, may give encouraging results; yet it must be acknowledged that the treatment requires a long time and is sometimes followed by relapse.

Children who suffer from incontinence are very frequently brought to electro-therapists. Here we must confess to some difficulty: the subject must be dealt with cautiously because I am convinced that we are almost powerless to treat those cases in which there is so often the stigma of psychic degeneracy.

Before ending this rapid enumeration of what we may call the paragnæcological diseases, will you let me mention a trouble in which our art nearly always gives us satisfaction, and the electrical treatment surpasses the surgical in its benignant effects? I refer to aching sphincter fissure, in treatment of which the high frequency current, taken from Oudin's resonator, and conducted into the anus by aid of a metallic or a MacIntyre's glass electrode, may be regarded as a potent therapeutic measure. Statistics show that, generally, a few séances will remove this most painful disorder quite satisfactorily. I should like to give you some information as to the strength of the high-frequency current. But this is not easy, as we need a measuring apparatus for the high tension current from the resonator. When glass electrodes are chosen, this strength must be such that the patient may support it four or five minutes without any sensation of burning. Aching disappears sometimes after two or three séances, in three or four days; the fissure heals, on an average, after five or six séances.

DISCUSSION.

Dr. C. A. ROBINSON presented a report on the treatment by diathermy of gonorrhœal cervicitis and urethritis. He said that the diathermy machine was first brought to this country in 1911. In 1913 Dr. Cumberbatch used it as an investigation for the treatment of all forms of joint affection. He found that in some cases, not only was the pain relieved, but the joint affection cleared up in a surprisingly short space of time. The cases which had thus cleared up were cases of gonorrhœal rheumatism. This investigation, suspended till after the war, was resumed and extended to include other gonorrhœal infections.

A method devised by Dr. Cumberbatch had now been in use in the Electrical Department at St. Bartholomew's Hospital for over two years for the treatment of gonorrhœal cervicitis and urethritis in women, and he had entrusted him (Dr. Robinson) with the carrying out of the treatments. The first case, one of gonorrhœal urethritis, bacteriologically confirmed, came for treatment in October, 1919. She was treated by passing a metal sound into the urethra and passing the current for ten minutes. After that she was lost sight of, but about a month after they heard she had been to the Special Treatment Centre, where an examination had failed to show the presence of the gonococcus. The next case was presented as a case of gonorrhœal cervicitis, bacteriologically confirmed. This patient received three treatments. The method used consisted in passing a glass speculum, grasping a swab soaked in a 10 per cent. solution of salt in long forceps and passing it down the speculum into contact with the cervix. The handle of the forceps was then connected to the diathermy machine.

After three treatments she was sent for re-examination. This was negative in regard to the cervix, but showed that gonococci were present in the urethra. The urethra was then treated, with the result that it was found to be free from gonococci. Since then cases of gonorrhœal cervicitis and urethritis had been regularly treated, and up to the present no case could be said to have proved refractory to the method. Many, in fact most, of the cases coming to them for treatment did not come with a positive bacteriological diagnosis of gonorrhœa. The organism could not be demonstrated although there could be no reasonable doubt as to its presence. A large number now of such cases, who had had the usual three to five treatments, had been relieved of the discharge and other symptoms. There were, however, twelve patients who had come with a diagnosis of gonorrhœa, bacteriologically confirmed. In all of these cases except one, after from three to five treatments by diathermy, the bacteriological re-examination had proved negative. The husband of the patient whose re-examination yielded a positive result was at the same time attending the Special Treatment Centre for gonorrhœa and with little doubt her case was one of continued infection.

It was difficult to keep these patients under observation after the termination of their treatment, perhaps more so than in any other class of patient. One patient had, however, been observed for a period of one year after the treatment, with repeated bacteriological examinations, all of which had proved negative. One patient had been observed for six months, two or three for four months, and others for a month or so with a like result. The effects of diathermy were generally most marked, but there had been several cases in which a fairly long treatment of the joints by diathermy had not produced a great amount of improvement. These cases had improved rapidly when the cervix and urethra had been treated. They had had similar results in men in whom the arthritis had rapidly subsided on treating the prostate and posterior urethra. The method now in use consisted in the introduction into the urethra of a metal sound connected to one pole of the diathermy machine, the other pole being connected to a large pad placed on the abdomen. The current was passed for ten minutes. The cervix was treated in a similar manner, the sound being passed through a speculum. The method already referred to of applying the current by the saline swab was found rather frequently to result in burns of the cervix. It was not now generally used.

The gonococcus appeared to be vulnerable to quite moderate rises of temperature above the normal. It was said to be killed in cultures at a temperature between 102° and 104° F. But there was no clear knowledge as to what length of time it was necessary to subject it to this temperature in order to produce this effect. It was difficult also to state the temperature to which the tissues concerned were raised by this treatment. In the case of men, however, it was known that the penis could be raised to a temperature of about 113° F. At this temperature the patient began to complain of pain in the urethra. He had kept a penis heated to this temperature for three-quarters of an hour without any destructive effect, in fact without any subsequent reaction being apparent. In dealing with sensitive parts such as the urethra, considering that no anæsthetic was used, it was not likely that any destructive effect would be produced with the currents tolerated. In the case of the insensitive cervix, however, great care must be exercised, though, as a matter of fact, nothing more than quite superficial sloughing had ever occurred. It might well be claimed for Dr. Cumberbatch that in the diathermy treatment of gonorrhœa he had introduced a very valuable method of treating this disease.

Dr. AGNES SAVILL said she had used galvanism with success in the treatment of many types of uterine hæmorrhage: (1) Profuse periods occurring with endocervicitis were cured when the discharge was arrested by zinc ionization. (2) Profuse periods due to endometritis were restored to normal after zinc or copper ionization had remedied the discharge. (3) Hæmorrhage due to a cervical polypus was cured after twisting off the polypus and applying zinc ionization, 15 ma. for ten minutes on one or two occasions. (4) The menopause "floodings" usually responded well to zinc ionization, eight to ten applications. (5) Frequent and profuse periods of many years' duration were curable when no tubal or ovarian disease was present. Under this heading were included the cases of apparently causeless hæmorrhage in young girls. (6) When there was an

enlarged uterus, and disease of tubes or ovaries, the uterus could be restored to normal, and irregular profuse periods often became regular, but the pain and excessive flow were only temporarily aided by uterine treatment. (7) In early fibrosis of the womb, the periods became more normal, and the muscular wall was rejuvenated. Dr. Savill referred briefly to the technique of copper and zinc ionization in these cases and to the method of action of the current. In all cases the enlarged uterus became normal, after on an average three to six treatments; the congested flabby muscle became firm and elastic, whilst the sclerosed muscle, with treatment by the negative pole, became yielding and normal. This was of great importance in the treatment of sterility. Dr. Savill quoted details of typical cases, the most remarkable being that of a girl aged 23, who had always bled profusely for weeks or months when a period began. She had been curetted three times; every drug and endocrine preparation had been tried. There had never been any discharge; the blood-coagulation time was normal. When the treatment was begun the menstruation had continued for seven weeks, and was still flowing so profusely that hysterectomy was being considered. Copper ionization was given, 20 ma. for fifteen minutes on eleven occasions between September 30 and November 2, 1920. The sound passed over 4 in. at the first application; at the sixth application, the womb was of normal size. When seen nineteen months later, the patient said the periods had been regular and normal since the treatment and that she had had excellent health. In another case there had been discharge and menorrhagia for nearly eighteen years. Both cleared up under treatment with zinc ionization, carried out for six weeks. And in another case, with irregular, profuse, and very painful periods, the patient had a flabby uterus 5 in. long, and a hard, tender ovary. The uterus was restored to its normal size, and the periods became regular; but the hard, adherent ovary caused such dysmenorrhœa that surgical aid was required.

Dr. ELIZABETH SLOAN CHESSEER described the treatment of endocervicitis by zinc or copper ionization, and incontinence of the bladder from paresis of the sphincter or from chronic cystitis by faradism, as taught by the late Dr. Samuel Sloan. When the sphincter was involved after parturition the current should be taken from the secondary, interrupted by a metronome and measured by a Sloan's faradimeter, and it could be given daily or on alternate days for fifteen or twenty minutes. In cases of cystitis, the primary faradic current was preferable.

Dr. W. J. TURRELL (abstract), discussing the treatment of amenorrhœa and dysmenorrhœa by diathermy, said that it was most important when a new form of electrical treatment was introduced, first to understand fully the nature and the causation of the condition to be treated, and secondly to explain clearly the mode of action of the electrical method selected. The second of these conditions, so far as the therapeutic action of diathermy was concerned, presented no difficulty. It could be unquestionably demonstrated, both experimentally and clinically, that the primary effect of diathermy was to heat up any organ, however deeply situated, or any part of the body to any required temperature. It could further be demonstrated with equal clearness and certainty that the consecutive effects of such heating were the dilatation of the blood-vessels, the relaxation of tension and spasm, an accelerated blood supply with a resulting improvement of nutrition and an increased functional activity in the part treated. Further, analysis of this action of high-frequency currents of quantity would show that it was divisible into two parts, the first part producing the relaxation of tension and spasm, resulting in the relief of pain: the second part in an increased blood supply and a consequent improvement of nutrition. With this definite difference in the results obtained, it was evident that the technique was not necessarily the same in the two cases. As a general rule if the relief of pain was aimed at, the current should be applied at a relatively greater intensity and for a comparatively shorter time than if the object were to obtain the best nutritional effects in the parts treated. In the treatment of amenorrhœa the increased nutritional effects of diathermy were required, and the current should therefore be administered for a relatively long period at a comparatively low intensity. In the treatment of dysmenorrhœa, the object was to induce the relaxation of spasm, hence a stronger current applied for shorter time

was required. Sir Halliday Croom, in his article on "Amenorrhœa" in Allbutt's "System of Gynæcology,"¹ gave the following description of cases of delayed puberty:

"Here the general and sexual development are complete, and yet the girls fail to menstruate. These cases are sometimes accounted for by the suggestion that the nutritive forces have been directed to the general organization. Some such girls have often too much physical labour. Thus among the poor, who do a great deal of manual labour at an early age, menstruation is often delayed. On the other hand, brain workers often exhibit the same symptom; by overwork of the higher functions the nutritive and reproductive systems are thrown out of balance."

It would, of course, be absurd to maintain that electrical treatment should be the method of choice in all cases of amenorrhœa, whatever their causation, but in the class of case outlined in Sir Halliday Croom's article, diathermy would appear to be indicated as a rational form of treatment, for by its means it was possible to redirect towards the ovaries the nutritive forces which had been diverted to the general organization by excess of physical or mental labour. With the present development of the feminist movement such cases must be met with in increasing numbers.

The following case of secondary amenorrhœa was quoted to illustrate the technique:

Miss N., a healthy, well developed girl, aged 20, not anæmic, had menstruated until ten months previously, when her periods had ceased for no obvious reason, and had not been re-established, although she had tried the usual medical remedies. She was a school teacher, and previous to the cessation of her periods had been working hard for her examinations. The treatment consisted in the administration of diathermy through the ovaries, from the abdomen to the back, utilizing 20 by 10 cm. electrodes, a current of 1 ampère for thirty minutes daily for the three days preceding, as nearly as could be calculated, the date at which the period should recommence. After three cycles of such treatment, menstruation was re-established, and had remained normal for the past twelve months.

His (Dr. Turrell's) attention was first drawn to the treatment by diathermy of dysmenorrhœa, for which there existed no removable cause, by a patient to whom he had been administering diathermy for pain attributed to a loose kidney, remarking to him that after her last treatment she had had the first experience for seventeen years of freedom from pain during a period. Acting on this hint, he had treated a series of five cases of dysmenorrhœa with distinct benefit. It often appeared that, if the menstruation took place normally and was free from pain for one or two periods, dysmenorrhœa would be absent in subsequent periods. The technique consisted in the administration for the three days preceding the period, of a current of 2 to 2½ ampères through each ovary in turn for ten minutes. One of the effects of the treatment was often to accelerate the onset of the period. During menstruation, it was not usually necessary to continue the treatment, unless the pain persisted. The results were such as might have been anticipated from a knowledge of the action of diathermy in relief of spasm and the spasmodic and colicky character of menstrual pain.

¹ Allbutt and Playfair, "System of Gynæcology," 1896, p. 344.

Section of Electro-Therapeutics.

President—Dr. E. P. CUMBERBATCH.

Radiology and Physics :

THE MACKENZIE DAVIDSON MEMORIAL LECTURE.

By G. W. C. KAYE, O.B.E., M.A., D.Sc.

I WOULD express at the outset my deep appreciation of the great honour you have paid me in asking me to deliver the Mackenzie Davidson Memorial Lecture. Nothing would give me greater pleasure than to feel that I was able to respond worthily to your invitation to do honour to a man whose memory all radiologists revere.

For Mackenzie Davidson was in many respects a man among men. There is none to gainsay his international prestige as a radiologist ; none to deny his skill in design, his experimental insight. His name will be for ever associated with X-ray stereoscopy. But more perhaps than that, there are many among us who love to remember his genial outlook on life, his cheery *bonhomie*, his shrewd yet kindly appraisal of his fellow men and their doings, and, not least, his encouraging attitude towards the beginner. I hold personal recollections of Mackenzie Davidson which, to me, are very precious, and I welcome the opportunity of paying tribute to a great man whom I had grown to call a friend.

Sir Ernest Rutherford, in the first Mackenzie Davidson lecture two years ago, drew attention to some of the achievements of modern physics and indicated their possible importance to the medical worker. I am not competent to follow him in his exploits in a field of atomic physics which he has made his own, but I will refer to a number of points which serve to illustrate the ever-growing importance of physics to the radiologist from a practical point of view.

I believe I may safely assume that appreciation of the physicist by the medical worker is quite a new thing, for the average student, with one eye on forthcoming examinations, is prone to dislike and mistrust physics, and is never at ease until he is free of the subject after his first M.B. examination. This mistrust probably arises from the early teaching of the student, to whom it is never brought home that a knowledge of physics, far from trammelling him in his immediate career, may ultimately stand him in good stead. In the specialist branches, such as radiology, most medical workers of standing regret that physics played so small a part in their early curriculum. They have now grown to realize the very wide part that radiology will play in medicine in the future ; and, further, they realize that, if radiology is to advance as it should, they will have to correlate it continuously with physics, which is ever advancing. Such correlation they may not find very easy. Not that the

physicists would look askance at the idea; the difficulty is that there are so few of them who are interested. For the physicist has never been taught to look upon radiology as offering the prospect of a possible career. Even had he been prepared to risk this prospect, he would not have found educational facilities to put him on his way.

Has such co-operation been given an extended trial? Yes, but scarcely at all in this country. There are probably not half-a-dozen physicists so employed. We have to go further afield. Before the war most of us were nauseated with the continual comparisons between the British and German schools of radiology, always to the disparagement of the British. But, even then, some of us had an uneasy suspicion, which time has completely justified and which recent accounts from visitors to Germany unanimously confirm, that the German had already discovered that the secret of progress in radiology was to bring the medical man and physicist continually together and let them work side by side. He went further and introduced them both to the manufacturer, but that is another story. I ask with all deference—does it look, at the present time, as if our appreciation of German technique and German apparatus has suffered through the war? Erlangen and Freiburg are in a position to answer. But, on the other hand, is the British radiologist in a position to submit rival techniques, backed up with a corresponding wealth of physical and scientific data? I hope that he is, but I fear he is sadly handicapped by not being able to rely on his brother physicist for the discharge of duties which he has neither time nor, possibly, the inclination, to see to himself.

If the Royal Society of Medicine is prepared to give whole-hearted support to these ideas of the future co-operation of the medical man and the physicist, it will have to use its great influence to secure the appointment of part or full-time physicists to the various hospitals, and further, to ensure that the Universities and other teaching centres put themselves into a position to provide physicists with courses of instruction calculated to turn out men of the right calibre and training. Such men will be given the opportunity of acquiring a sound knowledge of the physics of radiology, and they will also be well grounded in electrical engineering, especially on the high-tension side of the subject. By thus ensuring the maintenance of a steady supply of qualified physicists and electro-technicians, who know that in their future work they need not fear that they will not enjoy, both professionally and socially, the full status of their medical colleagues, we can look forward to a desirable all-round improvement in the science and art of British radiology.

Few of us at one time imagined that the X-rays play a material part in Nature. We were, of course, aware that the average wave length of the radiation from a hot body shortens as the temperature rises, and that in the case of our highest terrestrial temperatures the range of emitted wave lengths extends well into the ultra-violet. But very much higher temperatures are realized in the sun, and modern speculation—noteworthy that of Eddington—indicates that the sun is not only a source of heat and light but of X-rays and electrons in abundance. Such electrons as escape from the sun are almost wholly arrested by the outer layers of the earth's atmosphere, and we thus have a ready explanation of the fact that the natural ionization, or conductivity, of the air increases the higher we go, the rapidity of the increase suggesting large values at great altitudes. The sun may be looked upon as a huge X-ray bulb which accounts, directly or indirectly, for the fact that the X-rays play a prominent part in atmospheric electricity and can be held responsible for some of the vagaries of wireless telegraphy.

Within the last decade the secret of the X-rays has been revealed and we have learnt that they are identical with the light rays in almost every particular, the main difference being that the wave lengths of the X-rays are much shorter. Until recently, a gap of about four octaves existed between the shortest known ultra-violet ray and the longest X-ray, but within the last few weeks it has been discovered that the continuity is complete and that the X-rays follow on, and, indeed, overlap the ultra-violet end of the spectrum. The study of this missing group of octaves had invited attention for some time. The grating method proved unavailing for the purpose, the wave lengths being too small for our artificially ruled gratings and too big for crystal gratings. Further, at either end of the gap the vacuum spectrometer had proved necessary owing to the extremely absorbable nature of the rays. The problem has finally been attacked with success in this country and America by a number of workers, using indirect photo-electric methods, and they have traced X-ray spectrum lines of various elements right across the gap and into the already explored ultra-violet (fig. 1).

The following are the wave lengths in Angström units—i.e., 10^{-8} cm. of the regions of the spectra we have been discussing: Visible light, 7,200 to

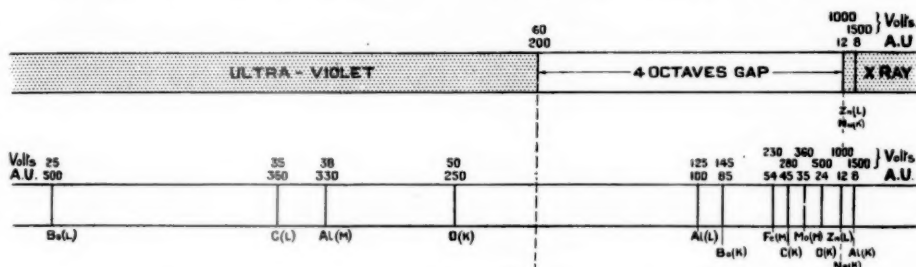


FIG. 1.—Some X-ray spectrum lines in the region beyond the ultra-violet.

4,000; ultra-violet light, 4,000 to 200; X-rays, 500 to 0.06; γ -rays, 1.4 to 0.01. It thus appears that we can now claim a knowledge of the existence of over thirteen octaves of X-rays, or, including radium γ -rays, nearly sixteen octaves. As yet the radiologist has only turned about three octaves of these to account.

I have referred to X-ray spectrum lines, for I need not remind you that the parallelism between light rays and X-rays is maintained by the presence of spectrum lines in the X-ray spectra. Just as the spectrum of a hot body normally consists of a continuous spectrum of white light, together with certain spectrum lines the wave-lengths of which are characteristic of the radiating material (e.g., the well-known D-line of sodium), so an element emitting X-rays not only gives out "white" radiation, but superimposes its characteristic lines on the general spectrum. The characteristic X-ray spectra are found to be much less complicated than light spectra, and are more readily sorted out into groups or series of associated lines. These several series, each of which includes a number of lines, are designated—J, K, L, M—and are broadly differentiated by a progressive increase in the average wave-length of each group as we pass from one to another, series J having the shortest wave-length and requiring the highest voltage to excite it. It should be added that all the constituent lines of a group are simultaneously excited.

For simplicity let us take the case of platinum, mount a target of that metal in an X-ray bulb, and subject it to a potential which is gradually increased, keeping the current through the tube constant. For the sake of the argument, let us presume that platinum can be caused to generate all the known characteristic series, and, further, let us suppose that our experimental arrangements are such that we are in a position to detect them all. As the voltage applied to the tube grows, the amount of "white" or general radiation steadily increases (according to a V^2 law). But, at a particular number of critical voltages, a new series of lines flashes simultaneously into existence, and the output and homogeneity of the beam are both temporarily enhanced. The approximate values of these critical voltages and corresponding wavelengths are as follows:—

Series	Platinum Exciting voltage	Corresponding wave length in A.U.
M	2,500	5.2
L	13,000	0.96
K	75,000	0.17
J ?	180,000 and upwards	0.07

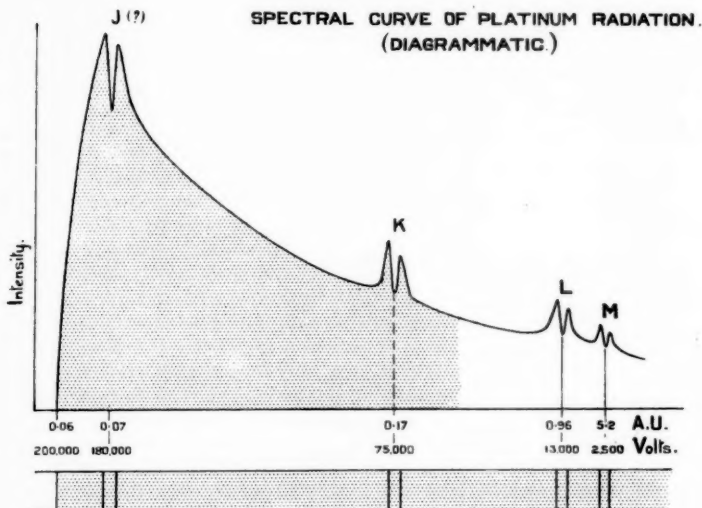


FIG. 2.

The J series is, as yet, undiscovered, and the data have been computed by the aid of Moseley's law, from the probable experimental values for other elements.

I have attempted to display purely diagrammatically in fig. 2 the emission curve for platinum excited by 200,000 volts. This shows the distribution of the X-rays among the various wave-lengths present. For simplicity only two lines are indicated in each of the groups of characteristic rays, which are superposed at various points on the smooth curve of output of general X-rays. The shaded area represents the X-rays which at present are turned to practical account. It is evident that the K and J radiations are the only ones of

interest to the radiologist, the L and M radiations being almost, if not completely, arrested by the walls of the X-ray bulb. The K radiation is excited to greatest advantage by about 100,000 volts (6 in. spark between points). The existence of the J radiation is problematical; there is some evidence that it consists of a large number of isolated lines excited by voltages in the region of from 200,000 (14 in. spark between points) up to perhaps 1,000,000. If so, we might hope to find evidence of its generation in the new deep-therapy tubes, and it would lend colour to the claim for the enhanced homogeneity at these high voltages. As far as output and homogeneity are concerned, there would appear to be advantages in running a platinum target tube at about either 100,000 or 200,000 volts.

If we now take the case of tungsten, then, as Moseley's law provides, the voltages are all correspondingly less than for platinum in the ratio of the squares of the atomic numbers.

Series		Tungsten Exciting voltage		Corresponding wave length in A.U.
M	...	2,000	...	6.0
L	...	11,000	...	1.1
K	...	70,000	...	0.18
J ?	...	160,000	...	0.08

Apart from the question of the existence of J radiation, there are many new problems of interest awaiting us when we are in a position to use still higher voltages. Should occasion arise, such voltages will be available. We have recently had news from America that Coolidge has succeeded in building a transformer which is capable of yielding one million volts. The problem of designing X-ray bulbs to stand up to such voltages will be no light one.

The work on X-ray spectra has thrown great light on the structure of the atom, and, in passing, I might remind you that present-day theory regards all atoms, of whatever kind, as built up of two kinds of "bricks" and two only—(a) negatively charged electrons, and (b) hydrogen "nuclei"—each over 1,800 times as heavy as an electron and carrying a charge equal to that on the electron, but positive in sign. In Rutherford's nucleus theory of the atom, now universally accepted, an atom is regarded as built up of a minute positive nucleus (to which practically the whole mass of the atom is attributed) surrounded by a cluster of electrons grouped in rings.

The total number of electrons in these rings is equal to the atomic number (N) of the atom in question. The nucleus of the atom is regarded as built up of hydrogen nuclei cemented together by electrons, the former being in excess to just such an extent that the nucleus as a whole contains N positive charges. This serves to counterbalance the N negative charges of the electron rings, the result being an uncharged atom. For example, platinum has an atomic number of 78. Its atomic weight determined chemically is 195. Thus, if platinum is a simple element, the platinum atom has a nucleus composed of 195 hydrogen nuclei and 117 electrons, the difference (78) serving to counterbalance the 78 electrons in the rings. The various elements only differ one from another in their having different nuclear charges, the nucleus determining the mass and radio-active properties, while the number and grouping of the cluster of electrons in the rings control the chemical and spectroscopic properties. For example, the K radiation is supposed to arise from the displacement of an electron in the innermost ring, the L radiation from the next ring and so on. This being so, if the J radiation is a real thing, it would seem that it is emitted by a ring system on the border of or within the nucleus itself.

Discussing a matter more immediately practical, I may state that within the last few years it has been clearly established experimentally by a number of physicists that there is a definite boundary to every spectrum of general X-rays on its short wave side. The position of this boundary (or quantum limit, as it is called) is not affected by the nature of the element emitting the X-rays, but is solely dependent on the maximum voltage applied to the tube. The relationship is given by the well-known quantum equation of Planck which is ever recurring in physics: $Ve = h\nu$, where V is the maximum applied voltage, ν is the frequency of the shortest wave, e is the electronic charge, and h is Planck's universal constant. Substituting the accepted values of the constants, we have: maximum voltage = $\frac{12,400}{\text{shortest wave length in A.U.}}$

This very simple relation provides us with a scale of quality which, if not perfect, is more exact than any which the radiologist has been in the habit of using. If we glance at typical spectral curves of X-ray emission, we see that they are not symmetrical—the centre of gravity of the curve is well towards the quantum limit—the shortest waves are the dominating waves, and still more so if the rays are subjected to normal type filtering. The mean effective wave length of a spectrum of rays is seen to approximate to the wave length of the peak of the curve—i.e., the wave length of maximum intensity. Now there

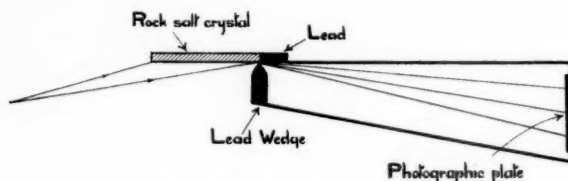


FIG. 3. Seemann Spectrograph.

is some evidence that this wave length of the peak (λ_m) is proportional to the limiting or quantum wave length (λ_0); in many cases λ_m is approximately $4/3$ times λ_0 . But in practice it is much easier to measure λ_0 than λ_m , and this fact gives an added importance to the measurement of the quantum limit and enables us so to identify very fairly the quality of a mixed bundle of X-rays. No doubt something depends on the wave form of the exciting potential, but the effect of this is probably less important as the voltage is raised. The precision of the method would be enhanced if steps were taken to standardize apparatus and technique, so that all work could be done by the use of, at most, three or four spectra, the distinctive features of which, including energy distribution, could be determined and specified.

But how is the radiologist going to measure wave lengths in his operating room? At present, the easiest plan appears to be by measuring the maximum voltage and using Planck's relation. The voltage can be obtained by use of a reliable type of electrostatic voltmeter, or, failing that, by measuring the alternative gap by means of some approved type of spark gap such as the sphere gap. We see that such measurements of the peak voltage possess a genuine importance. An alternative and better plan is to measure the quantum limit by means of a portable direct-reading spectrograph, of the type designed in Germany by Seemann and others (fig. 3). Incidentally, these direct reading

spectrographs act as very convenient and accurate high-tension voltmeters, which afford a measure of the true maximum voltage effectively operating a tube.

It would be in the interests of radiology if we were to make a start and begin referring to wave lengths or frequencies in our radiological work. Fig. 4 gives some comparative approximate values and shows that the difficulties of translation from present-day units are not formidable.

I have referred above to the effect of the magnitude of the exciting potential on the type of characteristic radiation generated. But in actual fact the radiologist of to-day is probably more concerned with general radiation than characteristic radiation. Here again a knowledge of the exciting voltage is of prime importance to him, particularly in regard to output. For the output of general X-rays is proportional to $N i V^2$, where N is the atomic number of the anticathode, i the current through the tube, and V the exciting voltage on the tube. V is the only factor coming in as a square term, and a small change in V has twice the effect on the output of a correspondingly small change in i .

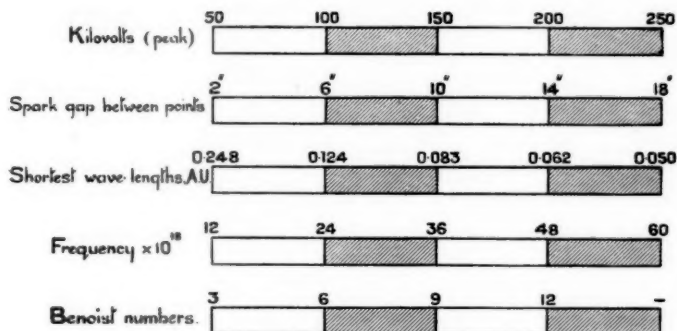


FIG. 4.

The truth of the above expression can be clearly established from measurements of spectral curves of intensity, in which N , i and V are varied in turn. One should not be tempted to regard these various spectra as accidental; the distribution shown in the case of, say, 50,000 volts is characteristic of that voltage and of no other, provided the same type of X-ray tube is adhered to. The efficiency of a gas tube is higher than that of a Coolidge, and the areas of the spectral curves differ correspondingly.

Let us now consider the surface of a body, at distance d from the target. The quantity of X-rays received per unit area in time t is proportional to $N i V^2 t/d^2$. This expression is the basis of a system of dosage (kilovolts-milliampères-minutes) which is probably as accurate and convenient in superficial therapy as any yet devised. We merely want data to give us the constant of proportionality, and here the physicist will have to join forces with the medical worker: it is not only physics but physiology.

The problem is not so simple in deep therapy. There are two things that may happen to a beam of X-rays when passing through a material. Part of it may be absorbed, which means that it is wholly transformed into characteristic

radiations of the material, the process always being accompanied by the liberation of electrons. The rest of the beam is scattered or dispersed, which, in effect, is equivalent to stating that while the rays are unaltered in quality, a considerable proportion of them have their direction altered. Scattering, which finds a close parallel in the dispersion of light by a fog, shows up in a more pronounced way with light than with heavy atoms. Further, just as in absorption, the extent of the effect naturally depends on the closeness of packing of the atoms or the density.

We explain these two effects—absorption and scattering—by supposing that absorption is caused by the flicking off by the X-ray of an electron in one of the ring systems in the atom and the prompt replacement of the electron by one from the next outermost ring, which, in its turn, is similarly replaced from the next outermost ring, and so on, the outcome being the vibration of the ring systems in question with characteristic periods, and the expulsion of an electron from the atom at high speed. This explains, for example, why we can generate L series without generating K series, but cannot generate K series without generating L (and M) series. If, on the other hand, it happens that the X-ray is incapable of definitely ejecting an encountered electron, but merely jars it, so to speak, then the electron, having absorbed the energy of the X-ray, vibrates not with its own free period but with a forced period which is prescribed by the X-ray and re-emits its new found energy in all directions, though chiefly round and about the original direction. With a medium weight or heavy atom the proportion of scattered to absorbed radiation depends upon the wave length and may be small. With a light atom the amount of scattered radiation is almost always large.

The problems of scattering have been under investigation by physicists for many years, but the question has come to the fore recently in radiology in connexion with deep therapy. The human body is made up chiefly of carbon, hydrogen and oxygen—all light atoms—and its ability to scatter X-rays in the adjacent air has long been familiar to radiologists, especially in screening work. But the extent of the scattering within the body itself is just as marked, and this is the case whether the rays are of medium or high penetration. It has been established by Dessauer and others from measurements made on specified areas at various depths within the tissue, that from 60 to 80 per cent. of the effectiveness of highly penetrating rays is due to scattered rays which originally were not directed at the area in question. In other words, calculations based on absorption data with narrow pencils of rays give results which may, by reason of scattering, be several hundred per cent. too small when compared with the results of experiment with ordinary divergent beams.

Fig. 5A shows the effect of scattering on the distribution of a narrow pencil of rays passing through a plate, and fig. 5B gives a notion of how, with a diverging beam, the results of scattering are to increase the amount of X-rays received on a selected area at a depth below the surface of a body.

The question of dosage comes to mind as a subject which has never received adequate attention in this country from the physicist. A number of units are in vogue, but whatever unit is ultimately chosen, care should be taken that it is based on sound physical premises and accurate data, so that it can be connected up, when occasion arises, with existing energy units in other branches of physics. The magnitude of the unit chosen should, naturally, be convenient from the point of view of treatment. The specification of a scale of dosage is not a task for physicists alone; for it is not beyond the bounds of probability that a physical and a biological scale of dosage would not keep in

step with each other, as the quality or hardness is changed. Few of us believe in the future of the pastille as a dose meter. If some convenient form of ionization meter can be designed to an agreed specification, it will probably provide the solution. It would not be difficult to associate an ionization unit with the British Radium Standard housed at the National Physical Laboratory.

Protection.—With regard to protection, more particularly in the case of X-rays, the history of the whole question bears a strong resemblance to that of the armour plate *v.* shell problem in the Navy, the two alternating in superiority as the one outstripped the other in effectiveness. As regards X-rays, it can safely be asserted that, at the present time, the X-ray has outstripped the protective measures in the majority of installations in this country. Most will recollect how a series of casualties to prominent radiologists a year or so ago alarmed the mind of the public. The situation had to be met and,

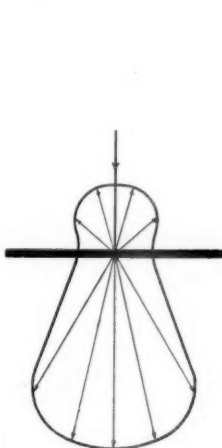


FIG. 5A.

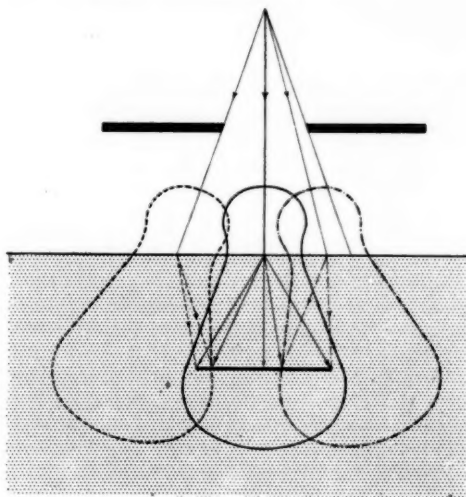


FIG. 5B.

arising out of a suggestion of Dr. Knox in a letter to the *Times*, the various radiological societies and institutions in London co-operated in the formation of a representative committee, who were asked to go into the whole question and draw up recommendations for the guidance of all concerned. It was agreed that the question of the protection of the operator was the sole issue: the existing measures had proved to be adequate so far as the patient was concerned. The word "protection" was to be interpreted in a wide sense.

The Protection Committee was fortunate in securing Sir Humphry Rolleston as Chairman, and under his leadership has already drawn up two memoranda. The second is on the point of publication; the first, issued last July, has received general approval on account of the thorough yet reasonable nature of its suggestions. I need not refer to them in great detail here, but they have already been widely acted upon, and I feel sure that in the near

future the bogey of X-ray dangers will have been laid. In years to come it will be a matter for congratulation that this country has given a lead to the world in promoting the protection of the X-ray operator.

The Committee has laid down certain standards of protection against X and γ -rays, which are expressed very simply in terms of the equivalent thickness of sheet lead. These thicknesses were based on available experimental data, for example, the X-rays from a tube excited by about 180,000 volts are cut down over 10,000 times by 3 mm. of lead, and over 1,000,000 times by 10 mm. of lead. The choice of the actual protective material may, of course, be determined by insulating, electrostatic, or other considerations, but its thickness should be such as to provide protection equivalent to the amount of lead specified.

The Committee sought and secured the co-operation of the National Physical Laboratory, both in investigatory work and in the question of the inspection of existing X-ray departments in hospitals and other institutions. The National Physical Laboratory has thrown itself into this work and has already inspected a number of the X-ray departments throughout the country. Hospitals are chary of spending money just now, but as the big London hospitals are giving a lead we may expect many others to seek similar assurance on the score of X-ray protection. It has been one of my duties to judge, in some cases at first hand, of the conditions prevailing at a number of hospitals and if these conditions may be regarded as typical—and I fear they can be—the Protection Committee needs no justification in its labours.

A small proportion of the departments were reasonably satisfactory, the majority were very unsatisfactory. In some instances the protection for the operator was lamentable in its inadequacy. We have taken with us in our inspection work delicate electroscopes, with the object of exploring the extent of the scattered radiation in different parts of the X-ray rooms. In some cases it was impossible to use them at all; we had to content ourselves with noting the comparative ease with which we could see the bones of the hand on a screen as it was carried round the room—and this with the protective appliances in full action. The Committee has adopted the common-sense principle that, wherever possible, the tube box or enclosure should form a complete shield in all directions, allowing only the minimum aperture for the work in hand. Few installations subscribe to this very reasonable demand.

It is established that ventilation is of prime importance, but, unfortunately, it would appear that many hospitals regard the radiologist as akin to a mole or earth-worm, which prefers to conduct its nefarious operations underground! Whatever be the real reason, we generally find the radiological department stowed away in the basement. Ventilation difficulties are usually multiplied tenfold in the basement and, further, the rooms are largely shut off from the beneficent effects of sunshine. How can a radiologist continue to do his best work under such conditions? Why should his department not be above ground?

We examine the high-tension system and find, in nine cases out of ten, it consists of stretched over-head small gauge wires, connected by spring tapes, or spirally-wound fine wires to the various apparatus. The coronal or brush discharge, when viewed in the dark, suggests a Brock's benefit night at the Crystal Palace! Naturally ozone is produced in abundance, and, as extractor fans are rarely fitted, the unfortunate operator gets the full benefit. If the apparatus is only occasionally used, as in some country hospitals, the practice of relying solely for ventilation on an open window may not be so serious as in a busy town hospital; but, unfortunately, that open window is often

effectually blocked by a light-tight shutter for the majority of the day. The Protection Committee has recommended the use of smooth tubes or rods or heavily insulated wires with the object of abolishing the evils of brush discharge. It suggests the employment of commodious rooms with ample head room, especially in the case of deep therapy outfits where the exciting voltages are in the region of 200,000. Another danger is here indicated: more than one fatality has been occasioned by accidental discharge to an operator working in a small room with slack or looped high tension wires. Again, ventilation questions are often especially troublesome in a cubicle.

Attention has been paid to the question of scattering, as some of the materials used in X-ray equipment, such as ply-wood, are prolific scatterers of X-rays and protection is needed in unexpected directions in consequence. The Committee did not forget the question of floor coverings, knowing that appropriate material has often prevented a bad accident.

Generous recognition should be paid to the X-ray manufacturers of this country for the way they are beginning to co-operate with the Committee. The British X-ray manufacturers, divided as they are, are mostly carrying on under great difficulties at the present time. Yet, despite their difficulties, almost all of them have taken steps to obtain from the National Physical Laboratory test figures for the various protective materials which they are incorporating into existing and new installations. Such measurements are rapidly and inexpensively carried out by the Laboratory and no radiologist need deny himself the security which the N.P.L. certificate affords. The laboratory experience amply confirms the necessity for such tests. For example, we have tested lead glass, of which only 5 mm. were required to give the protection of 1 mm. of lead. For other samples of glass as much as 10 mm. were required. The corresponding figures for lead rubber show variations between 1.7 mm. and 4 mm. as the equivalent of 1 mm. of lead. Thus, with either protective material a manufacturer can easily be 100 per cent. out in his reckoning if he employs uncertified material. He owes it to himself and his customers to take no such risk.

Incidentally, density or specific gravity, while furnishing a reasonable indication of security, is not strictly infallible. Absorption follows an additive law, and of two substances with the same density, the one containing some heavy atoms and some light may be expected to afford better protection than the one containing a like number of medium weight atoms.

In its second memorandum the Committee urges, among other things, the importance of N.P.L. inspection of X-ray equipment, and, in particular, foreign-made apparatus, large quantities of which are coming into the country and which are under no obligation to comply with British standards of protection.

Finally, mention of the Protection Committee brings me to another topic. As you know, the activities of British radiology are divided among several societies. In the formation of the Protection Committee the several societies have co-operated, for almost the first time, in providing means for achieving a result of common value to them all. May we take it as a good omen? Would the societies be acting wisely, for instance, in inviting the Protection Committee to take an enlarged view of its functions and tackle other questions, such as dosage and the specification of a unit of intensity of X-rays?

Better still, cannot the societies put their heads together and lay the foundations of an organization, the management of which would be vested in the elected representatives of the several societies, which could then fairly

claim to represent the whole of British radiology? Here would be the beginning of an Institute of Radiology. It would necessarily be an Institute without a home at first; bricks and mortar might follow some day in more propitious times. No question of amalgamating the societies would be involved, they would each pursue their own interests in their own fashion, but confident in the knowledge that when common interests were involved their representatives on the Institute would take such joint action as seemed to them best for British radiology. For example, had such an Institute existed now, it would probably have co-operated with the British Engineering Standards Association in its efforts to standardize X-ray and electro-medical nomenclature. The Institute of Radiology would naturally become the custodian of British interests when international matters in radiology claim attention.

Two noteworthy steps, pregnant with promise for the future of radiology, were taken by the establishment of the Diploma in Radiology and the formation of the Society of Radiographers. Here again this country has been in the forefront. And when, in the future, we get an Institute of Radiology, with which I hope it may be possible to associate Mackenzie Davidson's name in some way, and when, too, we get a British Journal of Radiology, combining the divided interests of the present publications, then two further great steps will have been taken to assist radiology in this country to take the proud position among the sciences to which its important and beneficent activities entitle it.

Section of Electro-Therapeutics.

President—Dr. E. P. CUMBERBATCH.

DISCUSSION ON THE PATHOLOGICAL CHANGES PRODUCED IN SUBJECTS RENDERED UNCON- SCIOUS BY ELECTRIC SHOCK.

Dr. T. M. LEGGE, C.B.E.

(Medical Inspector in the Factory Department of the Home Office)

said that there was an official regulation issued under the Factory and Workshop Acts that a notice should be displayed giving instructions for treatment of persons suffering from electric shock. Before this regulation came into force the *Electrical Review* had issued notices describing the first aid to be administered in cases of electric shock. It was felt that if there was nothing to add to this non-official notice it need not be replaced. What they wanted to know was whether the instructions were now sufficient in view of knowledge acquired since the experiments of Prévost and Batelli in Geneva in 1899.

Jellinek was the protagonist of the view that death from electric shock was an apparent death and not a real death. This view seemed on the whole contrary to that of Prévost and Batelli. In 1918, Professor Boruttau, of Berlin, attacked the apparent death theory. He gave statistics from the German factory inspector's reports showing that artificial respiration had been unsuccessfully employed. Although the statistics in this country did not yield definite information, such as they were, they supported the views of Boruttau. It was not a do-nothing policy that Boruttau advised, but merely the giving up of long-continued artificial respiration when there were no signs of the heart beating or of the pulse or respiration. If Jellinek's view were accepted, then every medical man when he was called to a case of unconsciousness from electrical shock, unless he insisted on the continuance of artificial respiration for hours, must be considered to have failed in his duty.

Mr. SCOTT RAM

(Electrical Inspector in the Factory Department of the Home Office)

said that the early public supplies of electricity were limited to a pressure of 125 volts delivered to the consumer. About 1896 the Board of Trade allowed a pressure of 250 volts. They also allowed up to 650 volts for power purposes.

[March 17, 1922.]

The three-phase alternating current system was introduced later. In 1909, the Board of Trade Regulations were again revised and as regarded factory premises all limitations as to pressure of supply were removed. The tendency had been towards increased use of alternating currents at high pressures.

Nearly all the accidents which occurred were due to persons touching one conductor only, when standing on ground which was not insulating. He had noticed that, when the shock was clearly as severe and as prolonged as that which had often produced death, when the victim had had a subsequent severe fall, he had recovered, and he suggested that this fact pointed to a possible and promising new method of resuscitation, applicable even in cases where cardiac fibrillation had supervened, by means of a counter mechanical shock. He asked that the medical profession should seriously consider it and advise how such a counter shock should be administered to the patient. The immediate effect of a low pressure alternating current shock was that the victim became rigid but was still able to shout for assistance or give directions for switching off the current. The area of contact was not important. Fatalities had occurred from contact of the tips of the fingers with ordinary tumbler switches. During the preceding month there had been a fatal case from contact with the small leading in wires of a broken lamp.

Dr. A. G. LEVY

said that he did not think it was possible for anyone who had had experimental experience of the result of applying a faradic current to the ventricles to do otherwise than agree with those experimental workers (Cunningham, Oliver and Bolam, Prévost and Batelli) who concluded that the most common form of death from electric shock was due to fibrillation of the ventricles.

The application of a faradic current directly to the mammalian ventricles caused them to pass into fibrillation, with a consequent total cessation of function. This result was not absolutely instantaneous, for a series of responses to the induction shocks occurred at intervals before fibrillation was established, but the more rapid the succession of interruptions the more rapidly was the result attained; the actual time taken varied from a fraction of a second to several seconds.

The same thing happened when an interrupted current traversed the heart in passing through the body, and a fatal or non-fatal result of a shock would depend upon the efficacy of the contact and the course taken by the current. Most experimental observers were agreed that currents of very high voltage, 1,200 volts and over, failed to affect the heart when passed from head to foot, but that they did so when passed directly through the thorax, had been demonstrated by Prévost and Batelli.¹ The reason for this remarkable deflection of high voltage currents from the heart had not been explained, so far as he was aware.

Prévost and Batelli had produced fibrillation by the passage of powerful single shocks from a condenser through the body at intervals of a few seconds. A succession of shocks was found necessary, and it was concluded that their effect was cumulative, but this would appear not to be the case. It had been

¹ *Journ. de Phys. et Path. Gén.*, i, 1899, p. 440.

shown by G. R. Mines¹ that a single shock would cause fibrillation if thrown in at the exact moment of cessation of the refractory period; at other moments it was either ineffective or produced an extra systole. It would thus appear that a person's heart might escape uninjured from a powerful single shock unless he were unfortunately struck at a precise and momentary phase of the cardiac cycle.

It had long been known that the application of a constant current to the ventricles would set up fibrillation, but with far less constancy and facility than by the faradic current. The mechanism involved in this connexion had not been investigated, and he was unable to give any further information, but it was evident that strong constant currents passed through the thorax would kill by ventricular fibrillation (Prévost and Batelli).

The respiratory phenomena following fibrillation when the respiratory centre was not affected was illustrated by a slide shown. The respirations continued, they became exaggerated from asphyxia of the centre, and then failed entirely owing to the cessation of the circulation. In men, it was said, these respirations might continue from one to one and a half minutes after cardiac syncope, and thus one might be presented with the remarkable spectacle of free respiration in a person apparently otherwise moribund from electric shock. In animals asphyxial convulsions frequently occurred, and the powerful expiratory efforts gave rise to loud moans, so that it was difficult to realize that death had occurred. Oliver and Bolam stated they had heard a dog bark after cardiac stoppage.

Ventricular fibrillation was generally regarded as a necessary fatal condition, but spontaneous recovery was very frequent in some animals, and with the return of the normal beat the respiration was resumed unless the centre had been damaged. It was his (Dr. Levy's) personal conviction that spontaneous recovery was not uncommon in man, but it could not occur at a later period than about two minutes from the onset of fibrillation. He would, therefore, expect that persons struck down by an electric shock, with the heart stopped and apparently dead, sometimes returned to life within the stipulated period, and that quite spontaneously.

Apart from the chance of spontaneous recovery, ventricular fibrillation occurring under the conditions of electric shock would appear to be a hopeless condition. Artificial respiration had been supposed, on the authority of Oliver and Bolam, to stop fibrillation; he had read the description of the experiment upon which this statement was based, and he found it incomprehensible. It might be taken as a fact that artificial respiration had no such effect.

"Massage" of the fibrillating ventricles was a certain means of restoring the action of the heart in the cat, and he believed almost equally so in man if properly carried out, but it was useless unless it could be put in force almost immediately; ten minutes was the maximum of time that the nerve centres could be deprived of blood without undergoing permanent damage; five minutes was the standard interval allowable. It followed that cardiac massage was not a practical measure, except for accidents occurring within the precincts of an operating room.

Prévost and Batelli had shown that single electric shocks which were strong, but not too strong, would restore the fibrillating ventricles to a normal

¹ *Trans. Roy. Soc. Canada*, 1914-15, III, viii, sec. 4, p. 43.

beat, and Batelli had amplified these observations with the interrupted current. It was conceivable how the brief application of a strong current might cause a contraction of that region of the cardiac muscle which remained excitable, thus causing the whole ventricle to be momentarily in a refractory condition, and so the progress of a circulating wave was necessarily blocked. But this method, according to Batelli must be employed within fifteen seconds of the accident; after that it was ineffective, but it again became effective after massage of the ventricles. There did not appear to be any hope of evolving a practical application from these observations, but they were perhaps worthy of further consideration and research.

Most experimental observers were agreed that the respiration might be paralysed by currents of high voltage, either momentarily or even permanently, if the currents passed through the head or neck, and this occurred even though the heart escaped. It was evidently so in animals, but such accidents must from their nature be rare in man, for it must be seldom that contact was made through the head or neck. A person thus affected, with suspended respiration and a beating heart, became blue from asphyxia, and hence there was an obvious indication for urgent artificial respiration, which should be continued as long as there was any indication of a heart beat. When, however, as must be more usual, the heart alone was paralysed, the patient was blanched without any cyanotic tinge, and the only chance of resuscitation was through spontaneous recovery of the heart, which was followed by restoration of the respiration. It was well, however, to bear in mind the possibility of both heart and respiration being paralysed together, so that it would be advisable to practise artificial respiration for a brief period even in cases of obvious cardiac syncope, in anticipation of a cardiac recovery. There was, therefore, reason for the accepted rule to proceed to artificial respiration immediately in all cases of electrical accidents, although its efficacy appeared to have been greatly exaggerated.

He had now dealt with the cardiac aspect of the case as far as time permitted, but in conclusion he would remind them of the advice which had been given, to use the foot in preference to the hand for disengaging a victim or detaching a live wire in cases of extreme urgency; it did not appear possible to stop the heart by any current which passed from leg to leg.

Dr. BERNARD SPILSBURY

said that he had made about a dozen post-mortem examinations in cases of death from electric shock. In almost all cases it was possible to determine the point of entrance and exit of the current by means of injuries and burns inflicted. Hæmorrhages beneath or in the skin were very constantly found. In the majority there was hæmorrhage into the muscles, and in one case a muscle was partially ruptured from violence of contraction. He had never found injuries to bone or periosteum. Usually there were absent any indications that the current had passed through the deeper structures of the body. He thought that in many cases the discharge might go through the skin mainly and death be the result of stimulation of sensory nerves. There were many parts of the body at which sudden stimulation of the sensory nerves might produce instant death, such as the nasal and laryngeal membranes. A

slight blow on the upper part of the abdomen had been followed by death and there were a number of cases in which stimulation of sensory nerves in the female genital tract had been fatal. Instant death following sudden and unexpected immersion in cold water compared well with that due to electric shock.

The most reasonable explanation of deaths occurring from electric shock was that they were due to a sensory stimulation causing paralysis of the respiratory centre. This justified the use of artificial respiration. Certainly there must be some cases—and there might be many—in which death was only apparent, and in which real death only supervened from the lack of some means of carrying on the essential function of the body.

Professor J. A. MACWILLIAM, F.R.S. (Aberdeen)

stated (in a written communication) that he had found by experimental investigation that there were two modes of immediate death by electric shock, and there might be a combination of the two: (1) Arrest of respiration from paralysis of the respiratory centre while the heart went on beating; here the promptitude with which artificial respiration was applied was obviously the prime consideration, offering as it did considerable prospects of success in some cases, when the damaging effects of the current were not too profound; (2) the other form of failure was overthrow of the heart's action by the sudden development of fibrillation, replacing the normal systole; *ventricular* fibrillation was the determining cause of death. After the supervention of fibrillation in the ventricles, slow deep respirations might still occur, but these soon ceased in consequence of the stoppage of the circulation.

As regarded the relative incidence of these two types of lethal effects on respiration and heart respectively, much depended on circumstances—the localities of application of the current, its strength and character, and the direction in which it traversed the parts involved. There was also the relative susceptibility of the ventricles to fibrillation from electrical stimulation, a feature that varied much, not only in different animals but in the same animal, and presumably in man, in different conditions affecting the heart, as he had pointed out in an article contributed to the *British Medical Journal*¹ in 1889, in which he called attention to the great importance of ventricular fibrillation as a common and unrecognized cause of sudden death in man in various circumstances, a conclusion the validity of which had now been generally accepted by workers in cardiology.

In the ventricular fibrillation due to electric shock, artificial respiration should at once be begun to keep open the possibility of recovery of the ventricular beat which might possibly occur, though if the period of ventricular fibrillation was more than a very brief one, the central nervous system would probably have suffered irretrievable damage from the period of circulatory arrest. The only active remedial measure that had been found useful in ventricular fibrillation so far, viz., massage of the heart through the diaphragm after the abdomen had been opened, was obviously not available under the conditions in which electric shock occurred. Heart massage, when applicable,

¹ *Brit. Med. Journ.*, 1889, i, p. 6.

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was rendered much more effective by the intracardiac injection of certain drugs, as described by himself in the *Proceedings of the Royal Society*¹ in 1918. These drugs were: urethane, injected into left ventricle or a vein, 0'025 to 0'25 grm.; strontium chloride, injected into left ventricle or a vein, 0'01 to 0'06 grm.; adrenalin, injected into left ventricle or a vein, 0'1 to 1 mg.; hirudin, injected into vein, 8 to 10 mg.; pilocarpine, injected into vein, 0'0025 grm.

¹ *Proc. Roy. Soc. Lond.*, 1918, B, xc, pp. 302-323.

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Some Notes in connexion with the Preparation of Vaccine Lymph at the Government Lymph Establishment.

By F. R. BLAXALL, M.D.

DETAIL is of paramount importance in lymph work. Meticulous attention to minute points at all times is requisite if the vitality, the quality and immunizing properties of the lymph are to be maintained. Such detail, though of great interest to the intimate worker, is apt to be tedious to those who regard the subject from a more distant standpoint, but as it is I can only lightly touch in a short paper of this kind on a few points.

The most suitable animal is the calf, though many others are susceptible to vaccinia. The age of the calf should be from 3 to 6 months. The colour of the coat, the quality of the skin, and the general health or "condition" of the calf should be noted.

Coats.—Calves with red and white coats are preferable. These generally have a pinkish-white skin, soft and supple, and free from pigmentation. All-red calves come next in value, but some may have brown or discoloured skin, and these do not give first-class results. Calves with all-white coats generally have skins of only medium quality, often they are rough, and in some the hair grows with great rapidity, obscuring the vesiculation and perhaps interfering with its proper development. Where the skin is pigmented vesiculation does not prosper, hair grows freely, and the results are poor. Hence all-black calves generally have very poor skins, and, if practicable, should be rejected for vaccination purposes. But not always; some calves with all-black coats, the hair glossy, with a slightly red or tawny tinge, have clear pink skins of excellent quality. Roan calves generally have good skins, but not if the bluish hairs are dark and arise from pigmented patches.

Skin.—The colour of the coat and the skin are closely related, and the quality of the skin is of importance. The ideal skin is white or pinkish-white in colour, clean, shining, smooth and soft to the touch and supple, but not too thin nor too thick. The experienced touch can distinguish the ideal at once. Rough, scurfy, pimply or eczematous skins invariably give poor results.

Condition.—The most important factor, namely, "condition," largely determines the response of the calf to vaccination. It is closely related to susceptibility. The general health of the calf is important. Feeble ill-nourished calves and overfed fat calves only exceptionally respond well.

An irritable fractious calf generally gives an indifferent result; the most suitable calf is an alert contented one.

Apart from qualities of coat and skin, the breed of calf does not appear to count. We use the ordinary English Shorthorn. Irish calves are preferable,

for they are older, bigger, and easier handled when put on the market. English calves are put on the market when very small, not weaned or only partially so, and are apt to be very fractious. I have tried Jerseys and Alderneys as pure bred calves, but without advantage.

HOUSING OF CALVES.

Stables should be clean, spacious, airy, well ventilated and well lighted. We have four stables, each containing twenty stalls. Two are quarantine stables, in which the calves are kept for a week after arrival, to be cleaned, cared for, and generally observed. Next they are passed to the vaccinating stables the day before vaccination. When the number of calves vaccinated per week does not exceed twenty, the two quarantine and two vaccinating stables are used respectively alternately, so that each stable gets a complete rest of a week.

DETAILS OF STABLES.

Our calves are housed in stables 48 ft. long by 28 ft. wide; well lighted on all sides with casement windows. Each of the four stables holds twenty stalls, ten on each side, arranged in two rows with a 6 ft. gangway between. The heads of the stalls are separated from the side walls by a 5 ft. gangway, so that there is a free air space around each group of stalls. The stalls are constructed of galvanized iron bars, arranged at such a distance from one another that the calves' hoofs cannot slip between. The iron bars permit the animals to see one another, as a calf shut up by itself is generally miserable. The hay racks and milk troughs are placed outside the head of the stall, and are so arranged that the hay racks can be swung outwards, thus allowing all the calves to drink from the troughs at the same time, for nothing seems to exasperate a calf more than to see another drinking if it cannot do the same.

Within the stall, close to the head end, are swing gates of galvanized iron, something like a trave, which when closed prevent the animal from licking the vaccinated surface whilst allowing it full freedom in all other movements. This is a great improvement on the old wooden neck collars or other appliances used for the same purpose. The floor of the stall consists at the head end of an asphalt cushion sloping slightly downwards to the rear, and this is followed by a teak batten. This is movable, and thus can be readily cleansed. The walls of the stables are lined with crystopal, and the floor is of asphalt, so graded as to drain to two gullies at either end of the stable.

Hot water radiators arranged along the sides provide artificial heat when required, and the stables are lit by electricity. Each stable has large double doors at both ends. Attached to the stable is a forage room, where the day's supply of hay and straw is kept, and where milk troughs are cleansed and necessary implements, utensils and appliances are stored.

Over each stable is a loft for the storage of hay, straw, &c. The loft is entered by an outside staircase, so that it has no direct connexion with the stable. These arrangements combine to produce spacious, airy and well ventilated stables, in which calves can be housed.

The stable, as already said, contains twenty stalls, arranged in two rows. When ten calves or a smaller number are to be vaccinated in the week the calves are changed over from one side to the other every day, so that there is every facility for cleansing each side in turn. Similarly the stables are used alternately week by week, thus giving one stable a complete rest of a week.

FOOD.

Calves are fastidious feeders. We supply them with hay, milk and water, or water alone, sometimes with a little oatmeal mixed in the milk. But if the hay is not to their liking, if it has what is known as a "brown nose" rather than a "green nose," they may refuse to touch it, or may take a morsel only here and there, but they will starve and fall down exhausted rather than eat what does not please them. Apparently, with unsuitable fodder before them, calves lose all appetite for it and decline it. A calf accustomed only to milk will thirst rather than drink water. Calves which will not drink water are given milk and water (mixed in equal proportions and warmed). I have occasionally known calves accustomed to water refuse milk in the same way. Many calves come to us not weaned, or only partly weaned, and these have to be bottle-fed or coaxed with artificial nipples, &c., to drink the warm milk. To obtain good results in vaccination, the calves you vaccinate must be happy and contented, and will not be so unless careful attention is given to their food as well as to their stable conditions.

VACCINATION OF THE CALF.

Lymph.—If a calf is vaccinated with ordinary lymph as collected from another calf, and the product is carried on from calf to calf, the resultant lymphs will almost invariably display a gradually increasing weakness, till at a variable but not far distant number of removes the lymph will cease to produce good vesiculation altogether. To carry on successfully from calf to calf the lymph used must be the very best, and one that has shown no sign in any way of deterioration. Hence to maintain the potency of the lymph it is essential to devise means to obtain the best lymph for the vaccination of calves, and to know that one has it.

The sources of lymph may roughly be classified as follows:—

(1) *From Small-pox direct.*—Small-pox material if gathered at the right time can set up vesiculation sometimes when applied directly to calves or monkeys, but my opportunities of applying this method have been very few. Once only out of five attempts have I seen vesiculation result on a calf from inoculation of small-pox material. In the successful attempt the lymph very speedily degenerated and was practically *nil* at the third remove. More experienced observers, however, speak highly of the method and in some places where small-pox is prevalent it is stated to be the usual method of renewing stocks. Many think that several removes on calves are advisable before transference to children; it is not easy to say why, nor how the requisite number of removes could be ascertained.

(2) *Cow-pox.*—If cow-pox is the inoculation of animals in their natural state with small-pox material as some believe, the results should be somewhat similar to the artificial inoculation mentioned above. I have used cow-pox material several times for the inoculation of calves. Frequently it has failed completely but sometimes it has produced typical vesicles. In my experience however the resultant lymph carried on from calf to calf tends rapidly to degenerate and die out in the fourth or fifth remove. So that as far as my experience goes cow-pox material is of no value as a source for stock lymph.

(3) *Retrovaccination or vaccination with lymph from the human arm* has been employed frequently and once I had considerable experience of it. Human lymph often gives very beautiful vesicles on the calf and can be carried on from calf to calf. But here again the lymph speedily shows signs of

deterioration and it very soon becomes necessary to revert to fresh supplies. I have long discarded this method.

(4) *Direct from the Calf.*—I have already said that ordinary lymph carried on from calf to calf is useless for stock purposes. But if a calf can be found with all the ideal qualities I have mentioned in conjunction—good coat, good skin and good condition—and it be vaccinated with a first-class lymph it may yield a first-class lymph in return. If so, this is I believe the very best lymph that can be obtained for stock purposes but such ideal conditions are too rare to carry on the supply.

(5) *Interchange of Stocks with other Establishments.*—This is probably the commonest method of renewing stock. When a lymph establishment finds its stock deteriorating it applies to a sister establishment for a small supply of stock lymph. This method tends to standardize lymph stocks and lymph supply throughout the world and undoubtedly does good, for the best stock is likely to come to the top. I have sent lymph stock all over the world. Generally it has been reported that these lymph stocks have done well but not always so, more especially where the lymph has had to go long distances and through tropical climates. I have received lymph stocks from many places, some good—some not so good. Stock lymph from Cologne gave the best results on our calves, as there they employed a very excellent lymph of fine appearance and high quality and I often used it in the early days to renew my stock.

(6) *Inoculation of Rabbits for the purpose of renewing Stock.*—In 1900 I suggested passage of lymph through rabbits and guinea-pigs thinking that it might improve the strain. Experiments were made with rabbits, but owing to an error in technique and to insufficient experimentation, the results were considered unsuccessful. Subsequently Calmette, in France, and Pfeiffer, in Germany, reported strongly in favour of rabbits for this purpose and advocated its use.

I then made further experiments and found the results quite satisfactory. The initial error had been due to want of appreciation of the peculiarities of the rabbit's skin, which is extremely thin and is stated to have no rete Malpighii. If incised with a sharp instrument the skin immediately gapes and the lymph fails to take or takes only in a poor and crusty fashion. But if the skin be very gently abraded and lymph rubbed in, the result is a confluent eruption in which individual vesicles can hardly be distinguished. Indeed Pfeiffer at one time thought that the rabbit did not produce vesicles but in this I convinced him he was mistaken. The eruption should be removed from the rabbit at forty-eight hours or not later than seventy-two hours. A rabbit yields about $\frac{1}{4}$ gm. lymph pulp. The rabbits should be vaccinated with the best lymph obtainable, not with one which has shown previously signs of deterioration.

This method I have used for many years to maintain the potency of the lymph supplemented by the use of high class lymph obtained direct from the calf. The last stock obtained from Cologne was received in 1907. Since then the stock has been renewed entirely by these methods and presumably the potency of my stock lymph is as high now as it ever was.

PREPARATION OF THE CALF FOR VACCINATION.

When calves arrive they are placed in the quarantine stables and kept under observation for a week. During this period the state of health of the calf is critically examined, its weight is recorded and morning and evening temperatures noted. The calf is afforded a rest, after perhaps a long journey.

It is well fed and becomes accustomed to its surroundings, and it is well groomed with brush and curry comb; matted hair is removed with clippers.

At some institutions the calves are washed by actual immersion. This seems almost useless, as it is a process entirely foreign to the calf's habits in its natural state and is therefore likely to upset it.

Calves should be treated as naturally as possible so that they may be comfortable and contented. After a week's quarantine the calf is brought down to the vaccinating stable, provided its health is satisfactory.

To prepare the area for vaccination the calf is placed on the operating table and first the rough hair is removed by clippers over the area to be shaved. The area shaved includes the abdomen as far forward as the ribs and the inner side of the thighs. It is lathered with soap and warm water and shaved with an ordinary razor. Safety razors are not satisfactory. This is the first shaving and it is done on the day before vaccination. On the day of vaccination the area is again shaved closely and afterwards is thoroughly washed with soap and warm water, then sprayed with sterile water and dried with sterile gauze sponges and towels. No antiseptics are used, as they roughen and irritate the skin, and act as a rubefacient, thus facilitating the drawing of blood when incisions are made. Antiseptics do not sterilize the skin and injure the lymph as it is inserted or during its development. Thorough cleanliness and asepsis should be aimed at.

The sterile water is supplied from a receiver containing a metal spiral coil which can be connected with a steam pipe containing steam at 20 to 30 lb. pressure. The water in the receiver boils quickly when steam passes through the coil. In the receiver is a rotary pump which sprays the water with considerable force on to the desired area. Plenty of water should be used so as effectually to cleanse the area. The combined receiver and pump is portable and is wheeled about from one table to another.

VACCINATION OF CALF.

Incisions are made with a scalpel, parallel and about $\frac{1}{2}$ to $\frac{3}{4}$ in. apart. Their length is determined by the size of the calf but usually they should not exceed 6 in. in length. The scalpel should be sharp and the skin should be gently but firmly stretched. The touch should be light and the incision of even depth throughout, just sufficient to open the skin but not to draw blood. The drawing of blood does not affect the development of vesiculation but is apt to spoil the appearance and evenness of the result.

The lymph is run into the incision by means of a rather heavy nickel spatula with a thickened handle. The lymph to be used is held by an assistant in a watch glass and the spatula is dipped into it and carefully inserted into the incision, this being facilitated by keeping the skin on the stretch by the operator's left hand with the assistant's help. It is not advisable to make many incisions before applying the lymph, as frequently the edges of the wound swell very quickly and close the incision, thus preventing the insertion of the lymph. Calves vary much in this respect and it is advisable carefully to watch the behaviour of the skin as one makes the incision. In vaccinating, all the incisions should be made of even depth and the lymph run into them evenly and thoroughly. After vaccination the calf is taken back to the stable and the head gates, which prevent the animal licking the vaccinated area, are closed twenty-four hours later.

No covering is placed over the vaccinated area. Coverings of all kinds are objectionable; it is impossible to prevent them being soiled and every fresh

one applied rubs and irritates the developing vesicles. They are detrimental to the development of the vesicles which ensues best when the vaccinated area is freely exposed to the air, but not to a strong light.

TEMPERATURE.

The normal temperature of a calf is 102° F. or thereabouts, with a diurnal variation of a degree or degree and a half; that is to say the morning temperature is 102° F. and the evening $103^{\circ}5'$ F. After vaccination no change in the temperature occurs the first two or three days. Generally the temperature commences to rise on the evening of the third day, reaching its maximum on the evening of the fourth. The maximum is usually about 105° F. but may reach 106° F. On the morning of the fifth day the temperature begins to fall but shows evening rises of decreasing amount for a few days. Very considerable variation is shown in the behaviour of the temperature but I have so far been unable to correlate it with the quality of the lymph produced.

COLLECTION.

This takes place on the fifth day or one hundred and twenty hours after vaccination. This is undoubtedly the optimum time as far as lymph development on our calves is concerned. But in some institutions lymph is collected on the third day, at others on the fourth and at some on the sixth. The toilet of the calf is the same as before. The vaccinated area is thoroughly washed with soap and warm water, then sprayed with sterile water and dried with sterile gauze sponges and towels. Collection of the vesicles must be made at a definite interval after the drying of the vaccinated area, otherwise the lymph pulp collected will vary in weight considerably according to whether the vesicles are dry or wet at the time of collection. This interval should vary with the moisture of the air; roughly, I find five to six minutes in summer and eight to ten in winter give fairly even results.

CHARACTER OF THE VESICULAR DEVELOPMENT.

The development and appearance of the vesicle is now carefully noted. If twelve calves were vaccinated by the same operator on the same day with the same lymph, on the fifth day these twelve calves would probably show different appearances, perhaps in all of them so marked as to be quite obvious even to the uninitiated, and they might range from the total failure to the perfect lymph. Such variations can only be due to the calf, and mainly to what we term the "condition" of the calf.

I will describe first what I have called the perfect lymph. In this the lines of inoculation have taken continuously, and all along them is a vesicular band, regular in elevation and in diameter. The elevation is from $\frac{1}{16}$ to $\frac{1}{8}$ in., and the diameter $\frac{1}{8}$ to $\frac{1}{4}$ in. The edges of the band where it springs from the normal skin are perfectly parallel, there are no indentations and no signs of individual vesicles. Every vesicle has merged into its neighbour to form one continuous whole. In colour the band is pearly-white tinged with pink, umbilication is seen as a slight depression running centrally and evenly along the band, and of a slightly darker pink colour. At the ends of the incisions the band is rounded off bluntly but evenly. To the touch it is firm but elastic. There is no areola or only a faint pinkish tinge on the skin at the edges of the band.

A lymph with such an appearance is undoubtedly of high potency and

high resisting powers, and excellent as a stock lymph. But such lymphs occur rarely and irregularly; you may see two in one week, and not another perhaps for months.

From a total failure to such a perfect lymph one can roughly graduate the results of development into several classes:—

(1) The total failure. Not a sign of vesiculation or irritation is to be seen. The incisions made when vaccinating have healed, and though only five days have elapsed hardly any trace of them can be seen. Such results fortunately are uncommon; probably the average is well below 1 per cent., but they are liable to occur in batches, and I have known as many as twenty-six in a sequence of 750 calves.

(2) The incisions have not quite healed, and show a slight redness along the lines. Here obviously there has been irritation, which has subsided.

(3) Raised red lines. Here there has been some attempt at papulation, the irritation has been considerable, but the whole process has aborted. This is one of the commonest kinds of failure.

(4) A group of appearances showing a somewhat similar condition, but with here and there a vesicle, either fully developed or slight, irregular in appearance or aborting.

(5) The group where vesiculation has taken place partially or slightly, perhaps with separate vesicles like beads on a string, or, where continuous, forming a narrow band not exceeding perhaps $\frac{1}{16}$ in. in diameter. Such slight development might be due to retardation, but if collection is delayed for a day or two development proceeds no further, and the vesicular lines abort or slowly dry up.

(6) Comprises the large group of average or ordinary lymphs. Here vesiculation has taken place more or less continuously over the whole area, but with some irregularities. The vesicles vary here and there in size and in appearance, some of them may be misshapen and with spreading or indented margins. The ends of the incisions often taper to a point instead of being evenly rounded off; there may be gaps in the lines of vesiculation and the areola may be marked.

(7) This is a group in which vesiculation is continuous and more regular, and leads eventually to the perfect lymph.

(8) There is still another group called "advanced" lymphs—not a good term, for it suggests that the vesicles have developed before their time. But this is not always the case, the condition being due more to an over-luxuriance of growth, the vesicles developing with an uncontrolled exuberance. The specific organism has overreached itself and broken down the usual barriers of resistance, or, from the other point of view, the leucocytic infiltration has been so fierce that it has unduly swollen and distorted the vesicles. The vesicular bands are swollen and broadened from $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter, generally very irregular in outline, umbilication marked, and the centre of the vesicles darkened as with hæmorrhage. To the touch the vesicular band feels soft and pulpy. The yield will be heavy in weight, and herein lies the trouble, for frequently the weight is greater in proportion to the potency, and though when used for vaccinating purposes the case success may be quite good, the insertion success may be below the standard, since the specific organisms are not sufficiently numerous to correspond to the increase of weight and subsequent dilution. Warm weather undoubtedly helps to promote this development, but it is not the sole cause, as advanced lymphs occur in cold weather. Again it must be attributed to the "condition" of the calf.

All these groups, from and including group (5), give satisfactory results as regards vaccination, though group (5) itself and the advanced lymphs are on the borderline of doubt.

It might be thought that "advanced" lymphs would be those most liable to cause inflammation and sore arms, but statistics do not bear this out, in fact I have been unable to trace any correlation between the character of vesicles on the calf and human vaccination except as regards general potency and resistance powers. In these respects the appearance of the vesiculation on a calf is quite a trustworthy guide, and the results which will follow as regards human vaccination can be fairly accurately gauged by a careful examination of the development on the calf.

COLLECTION OF LYMPH.

The vesicular material is collected from the calf by a sterilized Volkmann spoon, modified slightly in shape and curve, and placed in a sterilized bottle and labelled; after collection the calf is removed not to a vaccination stable but to a shed set apart from the general stable, whence it is taken to the slaughter house. Here a veterinary surgeon carefully examines the carcass and visceral organs, including the mesenteric and mediastinal glands, and forwards a certificate as to the health of the animal. The certificate is very seldom other than "quite healthy," but tuberculous calves do occur occasionally. In the last seven years, out of 6,916 calves so examined, 0.4 per cent. were notified as tuberculous. No lymph from a calf certified as tuberculous is issued.

TUBERCULIN.

Experimentation was made for a considerable time with tuberculin to ascertain whether calves injected with tuberculin before vaccination would give a sufficiently definite reaction to enable the presence of tuberculosis in them to be detected. But it was found that the temperature of calves was so erratic that reliance could not be placed on the method.

In some instances, after injection of tuberculin, rises of temperature occurred, strongly suggestive of a tuberculosis reaction, but post-mortem examination failed to show a trace of tubercle; on the other hand, there were some instances in which no reaction followed the use of tuberculin, but in which the autopsy showed tuberculous lesions. As is generally the case in young calves of the age employed by us, these lesions were very slight, limited often to a single mediastinal or mesenteric gland.

WEIGHT OF LYMPH COLLECTED.

The weight of lymph collected will depend upon the size of the calf, the number of incisions made upon it, and above all on the character of the vesicular development, leaving out of account such minor considerations as the dryness or wetness of the vesicles at the time of collection. An average lymph weighs 9 or 10 gm., but the weight may range from 2 to 30 gm. The lighter lymphs occur in small calves, and where the development has been partial and slight. Heavy lymphs occur in large calves, where the incisions are numerous, and are nearly always "advanced." Lymphs weighing more than 16 gm. are of doubtful potency. As described under "advanced lymphs" the weight is out of proportion to the potency, and though in case success many of them may be satisfactory, in insertion success they are almost invariably deficient.

I have never known a first-class or perfect lymph weigh more than 12 gm., generally their weight is about 6 or 8 gm.

It is not difficult to obtain a very heavy weight of lymph pulp from a calf, if numerous incisions are made and placed closely together, more especially if the stock lymph used is not of the first quality. But this heavy weight is always at the expense of quality.

A calf may be over-vaccinated. If the incisions are too numerous and the area vaccinated large, the whole development may break down and abort.

Quality is more important than quantity, and therefore it is best to aim at a standard weight of 10 to 12 gm. per calf, other things being equal, such as the size of the calf.

From the operating room the lymphs collected, each placed separately in sterile bottles, are taken to the machine room. Here, first, each lymph is turned out into a sterile crucible in order that it may be carefully examined and any hairs, &c., entangled in the lymph removed.

The lymph pulp is weighed and the diluent, equal generally to four times the weight of the lymph, is poured into a sterile beaker. The lymph is then passed through the triturating machine, which consists roughly of a nickel spindle revolving in a cylinder. The spindle is threaded with a diminishing screw, the larger threads at the top the finer below. The lymph is passed through at first with only sufficient diluent to act as a lubricant, then a second time with more of the fluid and finally a third time with the whole quantity. The aim is to obtain a homogeneous emulsion with the pulp in a very fine state of division and if the trituration has been properly carried out a loopful of the emulsion suspended in distilled water shows merely as a faint cloud, no definite particles being visible to the naked eye. There are limits however to the fineness to which the lymph can be brought. These are not reached in trituration such as above described, but if the lymph pulp be ground up with powdered glass or diatomaceous earths all the organisms present in the pulp, specific and extraneous alike, are killed and the lymph rendered inert.

THE DILUENT.

This consists of glycerine, 50 per cent. by weight; water, 50 per cent. by weight; clove oil, 0.1 per cent.

The glycerine (1) prevents growth of organisms present; (2) acts as a disinfectant; (3) and its viscosity forms a suitable vehicle for the dilution of lymph. After prolonged trial a proportion of 50 per cent. with water has been found to give the most satisfactory mixture.

Pure glycerine is always slightly acid and this acidity strongly tends to increase. Distilled water is also slightly acid. The lymph organism is adversely affected by conditions of acidity, therefore the mixture of glycerine and water after sterilization is carefully titrated and brought over to alkalinity by means of sodium carbonate or other alkali, and this alkalinization is repeated if acidity reappears.

The clove oil acts as a disinfectant.

EFFECT OF DISINFECTANTS ON THE SPECIFIC AND EXTRANEOUS ORGANISMS.

Nearly all disinfectants exercise some selective action on the specific and extraneous organisms. The extraneous organisms are less resistant and the disinfectant hits them first and hardest, with the exception of sporing forms. But it may at the same time injure or weaken the specific organisms. Unless

there is a considerable margin and we can ensure the destruction of the extraneous organisms without injuring the specific organism the disinfectant is unsuitable. The majority of disinfectants are unsuitable, but there are a few with a broader margin which, with care, may be used.

Glycerine itself is one of these, but its action largely depends on temperature. If a lymph be mixed with glycerine (and here by glycerine I mean always glycerine in 50 per cent. mixture with water; glycerine alone or at other strength has a different reaction) and placed at 60° F., the extraneous organisms will all be eliminated in a month, but the specific activity will persist for perhaps two months, after which it steadily declines to *nil*.

Again at 98° F. the extraneous organisms will be eliminated in three days or less, but the specific activity may still be maintained, though after that it rapidly declines and in another three days will probably be *nil*. If the mixture of glycerine and lymph be kept at a temperature lower than 60° F. the elimination is proportionately slower and likewise the action on the specific organism. This, however, is still considerable and is appreciable in both till the freezing point is reached, but at 10° F., that is, 22° below the freezing point, the action on the specific organism is inappreciable for at least two years, whilst the action on the extraneous forms still slowly continues till their eventual complete elimination.

Hence glycerine has a broad margin of safety and by subjecting glycerinated lymph to the influence of heat in nice adjustments such elimination as is desired can be effected without appreciable injury to the specific organism. This also explains why glycerinated lymph must be stored for any length of time at a temperature below the freezing point.

Carbolic acid is a disinfectant with a much narrower margin than glycerine. If used in sufficient strength to kill the extraneous germs it almost invariably weakens the lymph; but in less strength, sufficient to act slowly but incompletely on the extraneous organisms, it can be used without appreciably affecting the specific activity.

Chloroform is another disinfectant with a narrow margin. It acts rapidly and powerfully on the extraneous germs but not so rapidly on the specific. But owing probably to the difficulty in maintaining the solution of chloroform at even strength and owing to the further difficulty of removing all chloroform from the mixture it is variable in action and not infrequently severely weakens the lymph. Hence it is unreliable.

Ether is another disinfectant the use of which has been advocated. It has a still narrower margin and is quite unreliable.

I have experimented with a great number of disinfectants, inorganic and organic, but it was not till I tried the essential oils that I found a suitable agent.

Oils of cloves, of lavender, of aniseed, of cajuput, of marjoram, show some selective action, but oil of cloves I found by far the best. At the strength of 0.1 per cent. it has a strong action on the extraneous germs, reducing them from tens of thousands to hundreds in a week. After this the elimination is slower but goes on surely till practically all but sporing forms of *Bacillus mesentericus*, moulds and so forth are eliminated.

It works well with glycerine, and if lymph treated with the diluent as given above is subjected to a temperature of 60° F. for a week the elimination is hastened. In spite of this action on the extraneous germs the remarkable feature of clove oil is that it shows no appreciable effect on the specific activity for at least two years of storage. In this respect it is as far as I know unique

amongst disinfectants. Since 1912 all our lymph have been treated with clove oil and not once has there been any sign of injurious action on the lymph. Indeed since its introduction our success rates have slightly risen.

The only objection that I have heard raised against the use of clove oil is that it is slow in action. In that probably lies its safety. But as already seen by an adjustment of the influence of heat its action can be hastened, though if this were carried far it would probably be at the expense of potency.

Is rapid elimination either necessary or advisable? No one can hope to cope with the demands that would be made for lymph in a big epidemic or a great war by day to day supply. The only way to meet such emergencies is to have on hand a large stock which before its exhaustion allows sufficient time for the production and preparation of a further large quantity. For this purpose a cold store kept well below the freezing point is essential.

But if speedy elimination were considered necessary it could be effected adequately in other ways.

BACTERIOLOGICAL EXAMINATION.

After trituration the lymph emulsion is first examined bacteriologically and then placed in tubes efficiently corked and stored in the cold chamber with or without a preliminary week at 60° F. to assist in the elimination of the extraneous organisms.

From time to time further bacteriological examinations are made, the number of organisms present and the varieties being carefully noted. Anaërobic cultures and inoculation of special media for the detection of pathogenic germs are made, but these are invariably negative. The bacterial contents of lymph pulp comprise only the saprophytic organisms present in calf skin, the *Staphylococcus aureus* and *Staphylococcus albus* and their varieties and such organisms as are commonly present in the air, moulds, hay bacillus, *Bacillus mesentericus*, and so forth.

COLD STORE.

Heat, i.e., a temperature above freezing point, is most inimical to the vitality of the lymph organism. The less lymph after removal from the calf is exposed to heat, the longer is its potency maintained, and this obtains both with dried lymph and with lymph conserved with some medium, such as glycerine. As soon as this was even partially realized experiments were made to combat the influence of heat, and the result was cold storage.

The optimum temperature for cold storage is 10° F., or 22° below the freezing point. Any temperature below the freezing point is efficacious, though probably the lower the temperature within practical limits the longer will the potency be maintained.

Before the introduction of cold storage glycerinated lymph could only be kept six weeks if its original potency was to be assured. Only a small amount could therefore be stored. That this was inadequate to meet epidemic needs was realized in the comparatively small outbreak of 1900-1. But with cold storage any quantity can be kept and its potency should be maintained for years.

Cold storage alone enabled us to meet the heavy demands made upon us during the war; in spite of the large amount issued, our reserve never fell below three quarters of a million single doses.

Cold storage is of course essential for the preservation of lymph stocks. Its great value is now almost universally recognized, and there are few lymph institutions which have not adopted it in some form or another.

LYMPH IN CAPILLARY TUBES.

As required for distribution lymph is brought from the cold store in rotation, the oldest first, and capillary tubes are charged with it by means of air pressure, the ends of the tubes afterwards being drawn out in the flame and hermetically sealed. The amount in each tube is sufficient to vaccinate one case. I have often been asked how the dose that would be required was estimated. In the first place I made several experiments myself with differing amounts, and then asked the late Dr. Cory to make some trials. Dr. Cory was the vaccinator at the old Animal Vaccine Establishment, vaccinating from calf direct, and he was a very expert operator. He always vaccinated in five places. After a few trials he stated the amount he found sufficient, and this was taken as the standard. I estimated that the amount that Dr. Cory required to vaccinate in five places should be sufficient for the average public vaccinator to vaccinate in four.

The dose is really liberal, but occasionally I still receive the complaint that there is not enough in the tubes to vaccinate in four places, whilst on the other hand there are others who vaccinate two or even more cases with one tube. In one instance an officer reported the complete success of 350 cases vaccinated with fifty tubes, or seven cases to a tube. These were done in three places each.

Before general distribution a few tubes of each lymph are sent to certain vaccinators, who use them and report the results. This enables us to note any weak lymph or any ill-effects arising from it, and to discard it if necessary.

RESULTS.

The average results for civil primary vaccinations for the last twelve years, that is, since the introduction of cold storage, are: Case success rate, 99·5 per cent.; insertion success rate, 96·5 per cent.

During all this period the integers of the case success rate have remained the same—99, and the insertion success rate has only varied from 95·6 to 97. The highest result was in 1919: Case success, 99·6 per cent.; insertion success, 97 per cent.

Lymph is issued to some 3,000 public vaccinators, and is used on all kinds of children under all kinds of conditions, therefore the uniformity of these results is remarkable.

We can hardly expect to achieve higher rates than these; probably the figures are as good as the error of experiment will allow.

ISSUE DURING THE WAR.

For the two years preceding the war the average quarterly issue of tubes to the Army, Navy, and for civil use was: Army, 14,000; Navy, 6,600; civil, 91,000.

During the war period in the case of the Army the quarterly average was increased to 323,000, and in that of the Navy to 19,000. The amount issued for civil vaccinations decreased to 75,000.

The total amount of lymph issued during the war (from August 4, 1914, to November 11, 1918), was equivalent to 7,239,711 single doses, comprising: for Army and R.A.F. purposes, 5,588,453; for Navy purposes, 328,802; for civil purposes, 1,322,456.

The highest amount issued during one quarter was 628,146, viz.: for quarter ended June 30, 1916; of this amount 516,685 went to the Army.

The highest single demand (Army) was 50,000—this occurred twice.

The amount issued to the Army for each of the four years of war was : 1915, 1,256,273 ; 1916, 1,407,285 ; 1917, 1,225,093 ; 1918, 1,159,645.

In addition to supplies to British and Dominion troops at home and to the usual stations abroad and in France, our lymph has been used for Belgian, Portuguese, American, and possibly Serbian troops. Lymph has also been sent for use on numerous troopships, and to Mudros, Salonica, Scutari, Taranto, Genoa, Archangel, Alexandrovsk, and Murman Coast.

All demands were met as requisitioned, that is, on the day of receipt, except where otherwise desired.

A portion of every lymph sent to Army or Navy was issued for civil vaccination.

An Account of the Circumstances associated with an Outbreak of Disease among Milch Cows, Horses, and their Attendants, believed to be of the nature of "Cow-pox," in the County of Somersetshire in the Year 1909, and Considerations arising therefrom.

By RICHARD J. REECE, C.B., M.D.

VACCINIA OR COW-POX.

THE subject of diseases transmissible from animals to man has always been one of great interest to the student of preventive medicine. Vaccinia or cow-pox is one of these diseases ; it occurs in the bovine as well as in other animals, and when inoculated into man it has the remarkable power, as discovered by Jenner, of protecting the inoculated person from the infection of small-pox. That small-pox and cow-pox are closely akin, and that the former can give rise to the latter cannot be disputed, and though cow-pox may occur in a pastoral district it is not easy at the present day to trace its origin to a previous case or cases of small-pox. Opportunities, too, for investigating outbreaks of cow-pox are unfortunately not always available, and usually information regarding them comes too late to be of much value to the investigator.

For a full description of cow-pox, we can refer to the writings of Edward Jenner and his contemporaries, notably Bryce of Edinburgh, and to the later careful observations of Robert Ceely, in 1839 to 1842, published in the *Transactions of the Provincial Medical and Surgical Association*, and to the account given by Edward C. Seaton in his "Handbook of Vaccination," published in 1868. For the purposes of this paper, it will suffice to say that cow-pox is a specific eruptive disease of the vesicular order that affects cows. It is described by the early writers as "natural" cow-pox and "casual" cow-pox, according to whether the infection of the disease is acquired by the cow in a natural way as opposed to direct transference of infection from cow to cow by unintentional inoculation by the milkers. Apparently Jenner himself at first thought the disease in the cow was derived from a disease

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of the horse, the so-called "grease," and that the infection was transmitted from the horse to the cow probably by men who were attendants on both animals. Later Jenner recognized that this eruptive disease of the horse when communicated to man was capable of affording protection against attack by small-pox even though it had never passed through the cow.

That persons suffering from small-pox could communicate infection to cows was early known. Dr. Waterhouse, of Cambridge, Massachusetts, in a letter to Jenner, wrote¹:—

"At one of our periodical inoculations (i.e., for small-pox) which occur in New England once in eight or nine years, several people drove their cows to a hospital near a populous village, in order that their families might have the daily benefit of their milk. These cows were milked by persons in all stages of small-pox; the consequence was the cows had an eruptive disorder on their teats and udders, so like the small-pox, that everyone in the hospital, as well as the physician who told me, declared the cows had the small-pox."

No inoculations, however, were performed with the virus from the cows.

Whether cows could be infected with the virus of small-pox otherwise than by direct inoculation formed the subject of investigation by Dr. Sonderland, of Bremen.² He covered cows with blankets taken from the bed of a patient who had died of small-pox, and hung such blankets up around the head of the animal, so that it must breathe the effluvia arising from them. In a few days the cows manifested symptoms of cow-pox, and lymph taken from them produced genuine vaccine vesicles in the human subject.

This work of Sonderland arrested the attention of Ceely, who, in 1838, commenced experiments to ascertain the possibility of infecting the cow with variola after the manner in which Sonderland had succeeded. He enveloped two milch cows and one heifer, all in calf, in the sheets and blankets that had been used by a small-pox patient, but without result.

Later, in 1840, Ceely met with a case of great interest, in which there was good ground for believing that the vaccine disease was induced in cows by "variolaous effluvia." Eight milch cows and two stirks were turned out to graze during the day-time in a meadow at Oakley, in the Vale of Aylesbury, in which the clothes and bedding of a person who had died of malignant variola had previously been exposed almost constantly day and night for a week, and in which they were still always exposed at night, and not always removed in the morning before the readmission of the animals. On one occasion, at least, the cows were observed in the midst of the bed flock, licking it up. Within twelve or fourteen days of their admission to the meadows, five of the milch cows and one stirk exhibited simultaneously, or almost simultaneously, well marked cow-pox. It was most clearly ascertained that the animals, which were animals belonging to the place and had not been brought in from elsewhere, were in good health at the time of their admission to the meadows, and that there was no vaccine disease at the time anywhere in the Vale. None of the milkers had sores on their hands, *except those which they subsequently got from these cows*: besides, one of the infected animals was a stirk. The simultaneous attack of the animals showed a *common cause*. Ceely states that, in the whole course of his experience, he never saw so many primary cases together in a dairy at one time, as on this occasion. The

¹ *Trans. Prov. Med. and Surg. Assoc. (Vaccination Section)*, viii, p. 23.

² *Med. Gaz.*, 1831, i, No. V, p. 162.

period of attack after the first exposure corresponds entirely with what might be anticipated if the common cause of the outbreak were "variolous effluvia."¹

I have quoted this case somewhat fully as it is a record of the outbreak of cow-pox among cows which had been exposed to the infection of small-pox, and one point of special interest is that one of the affected animals was not a milch cow.

Ceely succeeded in his attempts to inoculate cows with lymph taken from casual cow-pox of the cow and with lymph obtained from the vesicles of vaccinated persons, and he offers the following observations:—

"There can be no doubt that the nearer we approach the practice of the 'best vaccinators of the cow'—the milkers—the more likely we are to succeed; and although, if it were possible to employ a number of small-pox patients to milk cows when their teats are chapped and cracked, we should not meet with the success that attends the manifestations of the former with a native lymph, yet it would not be unreasonable to expect a larger measure of success by this than by any other mode."²

Again, commenting on the vaccination of the cow with primary lymph, he writes:—

"Although I could not boast of the almost unvarying success which attends the casual vaccination of the milkers, yet I found much less difficulty in succeeding or than is experienced in vaccinating these animals with lymph taken from man."

He adds as regards milkers:—

"These men, without knowing it, are unquestionably the most successful vaccinators with primary lymph, and the most careful too, for they never neglect Bryce's test. We cannot fail to be vexed at their destructive proceedings, and impatient at their general lack of discrimination; but we must stop to admire the splendid success of their performances, which it would be well if we could imitate. They may indeed smile at our puny efforts."³

Nevertheless, I imagine that the method of the milkers would not commend itself to Dr. Blaxall, and that his success in the primary vaccination of calves is not less than theirs.

Spurious cow-pox was well known to Jenner, and in his writings he directs special attention to this, and to the disaster that may follow should persons who have received inoculation with the spurious cow-pock consider they were protected against small-pox. It was the knowledge of this spurious cow-pock that led Bryce to institute his test for successful vaccination. Ceely puts on record a variety of udder affections of milch cows that may be confused with the genuine cow-pox.

"The horse is subject, like the cow, to a specific eruptive fever, resulting in the development of a pock, the material of which has the same property as the fluid of cow-pox, of protecting the human system when inoculated with it, from small-pox. This pock has the outward appearance and the anatomical structure which distinguish the vesicles of cow-pox. The chief points in which the disease, as seen in the horse, differs from that in the cow, are (1) the locality of the eruption, which is chiefly on the heels, and on the naso-labial mucous membrane; (2) the tendency of the eruption in some cases to become *generalized* over the body; and (3) its appearance in the male as well as in the female, horses being subject to it as well as mares."⁴

¹ *Trans. Prov. Med. and Surg. Assoc.*, x, pp. 211-225.

² *Ibid.*, viii, p. 399.

³ *Ibid.*, viii, pp. 352-353.

⁴ "A Handbook of Vaccination," by Edward C. Seaton, M.D., 1868, p. 23.

Mr. Tanner, a veterinary surgeon at Rockhampton, so early as 1800, raised a perfect vaccine vesicle on the teat of a cow by first removing a scab from an accidental sore, and then rubbing over the sore with what he regarded as "grease." Lymph taken from the vesicle thus raised was successfully transferred to the human subject, and a stock of vaccine lymph thus obtained, some of which was sent to Jenner, and through him to the Small-pox Hospital.¹ In the same year (1800) Lupton, of Thame, more correctly pointed out that the disease of the horse, which was analogous to cow-pox, and was communicable to the cow, was not "the grease," nor any form of grease, but a disease regarded by the farriers in his neighbourhood as widely different from it, and to which they gave the name of "scratchy heel."² In 1801, Loy, of Pickering, distinguished two forms of grease, the acute and the chronic, and he regarded the acute form alone as capable of imparting the cow-pox to the cow or to man, and then only in case the matter were taken at the proper period of the vesicle.³ In France, doubts as to the existence of genuine horse-pox were entertained, until an outbreak of the disease occurred in horses at Rieumes, near Toulouse, in 1860, and another at Alfort in 1863, both of which gave rise to inoculations, with unequivocal results.

The infection of cow-pox, once introduced into a herd of milch cows, is spread from the cow first affected to other cows by the hands of the milkers and only milch cows are affected. Ceely states that he had "frequently witnessed the fact that stirks, dry heifers, dry cows, and milch cows milked by other hands, grazing in the same pastures, feeding in the same sheds, and in contiguous stalls, remain exempt from the disease."

I am not aware of any record of one animal being affected by another at any institution where calf vaccine lymph is produced, except by direct inoculation.

Robert Cory,⁴ when alluding to the fact that the specific vesicles are produced on those parts of the bodies of the cow and horse which are mostly brought into contact with the hand of man, adds: "It thus seems likely that if cows were not milked, and horses were not shod, their respective variolous diseases would cease, as far as we can see, to exist." Dr. Theile, of Kasan, who in 1836 and 1838 succeeded in inoculating the cow with small-pox matter, came to the conclusion that "the so-called vaccine is not an eruptive disease peculiar to the cow, but is produced in it by the transmission of human small-pox to it; and the man and not the cow, as has hitherto been thought, is the source of the disease."

The history of past outbreaks of cow-pox in England shows that when they have occurred there has been small-pox in the country and that in some way or another, though not always capable of direct proof, the casual cow-pox in cattle has been associated with antecedent small-pox in the human. Ceely, writing in 1840, said that he was inclined to believe from all the information he had been able to procure that cow-pox was not so often met with in the Vale of Aylesbury as it had been forty or fifty years before. There has been a curious absence of reports on outbreaks of the disease for a period of some forty years since Ceely wrote. This may be due, not to the entire absence of the disease from the country, but to the fact that observers during this period considered they could add no useful information

¹ Ring's "Treatise on the Cow-pox," i, pp. 26, 336, and Baron's "Life of Jenner," i, p. 348.

² *Med. and Phys. Journ.*, November, 1800, iv.

³ Loy, "Experiments on the Origin of the Cow-pox," Whitby, 1801.

⁴ Cory, "Theory and Practice of Vaccination," 1898, pp. 108, 111.

to the exhaustive inquiries and careful investigations of Ceely. The outbreaks of cow-pox in England that had come to the knowledge of the Local Government Board between the years 1887 and 1913 were tabulated by my colleague, Dr. Sydney Monckton Copeman. He found that there were one each in the years, 1887, 1888 and 1902,¹ two in 1903, three in the year 1909, two in 1911 and one in 1913. Since then there has been an outbreak at Fleckney, in Leicestershire, in 1915. In 1919 a case was reported and the circumstances were investigated by Dr. Copeman who could find no conclusive evidence that the disease, limited to a single cow, was actually cow-pox.

I am placing before you a short account of one of the three outbreaks of the year 1909, in which the disease occurred in milch cows, horses and their attendants.

In the second week of June, 1909, the Local Government Board, having learnt that milch cows at a dairy farm in the Frome Rural District were suffering from cow-pox, instructed me to investigate the matter, to ascertain, so far as practicable, to what extent the disease was, or had been, prevalent among the cows of the dairy farms in this part of the country and whether there was evidence that the outbreak of cow-pox in question had been directly related to antecedent small-pox in the human subject. Inquiries instituted by me in the Frome Rural, Frome Urban, Midsomer Norton Urban, Radstock Urban, Shepton Mallet Urban and Rural, Clutton Rural and Bath Rural Districts, showed that "cow-pox" had existed for some weeks previous to my visit and that it was widespread. In individual instances the disease appeared to have been imported into particular farms from places situated at a distance, viz., Salisbury and Dorchester; but, adjoining or in the immediate neighbourhood of such farms, there were others in which cow-pox had occurred coincidentally in time or at an earlier date. As already mentioned, cow maladies other than true cow-pox, or vaccinia, are characterized by eruptions on the teats and udders, and few farmers seem able to distinguish cow-pox from diseases simulating it. Although inquiry was made with patience and persistence, yet owing to the widespread cow-pox in Somersetshire and the impracticability of determining with any degree of reliability the date of its first occurrence, it was found impossible to ascertain whether or not there was connexion between cow-pox of the cow and small-pox of the human subject. In the City of Bristol and in its neighbourhood there had been an outbreak of small-pox at the end of 1908 and the beginning of 1909, and there had been an extension of the disease to Yeovil. The districts in which the cow-pox occurred, with the single exception of Midsomer Norton Urban District, had been free from notified small-pox during many years.²

¹ This outbreak formed the subject of inquiry by Dr. Copeman, *vide* "Report on the Investigation of an Outbreak of Cow-pox on a farm at Buckland, near Reigate," by Dr. S. Monckton Copeman, F.R.S. Thirty-second Annual Report of Medical Officer, Local Government Board, 1902-3, p. 258.

² Midsomer Norton obtained its recent small-pox in the following way: A young woman in domestic service in Bristol, who had been admitted on May 25, 1908, for small-pox, to a small-pox hospital belonging to that city, was discharged on April 1, 1909, her anomalous symptoms being regarded as not due to small-pox. She went to her home in Midsomer Norton, where she stayed from April 1 until April 14. Two of her male relatives, father and brother, both colliers, were notified subsequently, on April 21 and 23, as suffering from variola, and were removed to the local isolation hospital, where one of them died. Allowing in each instance twelve days' incubation period, one of these men was infected on April 9, and the other on April 11. On emergency, while one of these patients was delirious, a man was called into the hospital to assist in controlling him. This helper and the laundress, neither of whom had been afforded protection by revaccination antecedent to their being brought into contact with small-pox, developed the disease. The woman, however, had had a previous attack of small-pox when a child, and was pock-marked. None of these four patients appears to have had any dealings with cattle.

In all, some fourteen farms suspected of cow-pox were visited within the wide area referred to, and only two were found to be free from suspicion of cow-pox. The number of milch cows examined at the farms was 410, and 214 of these were found either to have been attacked by distinct cow-pox or to have come under suspicion as suffering or as having recently suffered from that disease. The cows on the farms and the number of milkers varied considerably in number. Opportunity was not always afforded of examining every milker employed, but of forty-four milkers examined, twenty-three were found to be suffering or to have recently suffered from cow-pox. In many of these cases, there was a history of a previously abraded surface of the skin, such for instance as cuts by knife or saw, or prick by a thorn. In several cases there were secondary vesicles on hands and arms. Most of the milkers had been vaccinated in infancy, and of those unaffected on invaded farms several admitted having suffered attack by "cow-pox" on previous occasions, whilst others had been successfully revaccinated during the small-pox prevalence of 1901-2, or at a later date while serving in the Army (figs. 1, 2).



FIG. 1.—Photograph of the hand of a milker, Mrs. "K.," aged 49, showing inoculation of cow-pox, of about one week's duration. She stated she had been vaccinated when a baby, but showed no marks of vaccination.

In this inquiry I had the advantage of the assistance of Dr. Blaxall, who visited some of the affected farms with me, and who subsequently made experiment with the material obtained from the affected animals on calves and rabbits at the Government Lymph Establishment. Certain facts of interest came under review, associated with our inquiry.

At one farm were three bulls, forty-seven cows, six cart horses and a pony. Five men and a boy were regularly employed there. One of these cows had been bought with her calf on May 4 at a depository at Salisbury. About May 12 the farmer noticed that this cow had sore teats. He had had no previous experience of cow-pox and attributed the cow's condition to cracked or chapped teats. It was only when the milkers became infected that his attention was particularly directed to this Salisbury cow. At the time of my visit to this farm (June 16) all the cows in milk were or had been affected and were in all stages of cow-pox. Each of the five men, the boy, and the farmer became inoculated with cow-pox. On June 16, the farmer had a sore almost healed on the right index finger, and about June 9 his left eye had

become inflamed, and the local medical practitioner told him his eye was inoculated with cow-pox. The farmer was disinclined to accept this explanation, but the deeper structures of the eyeball became inflamed and he was admitted to hospital for treatment. The result of the attack was that the sight of the eye was seriously affected. He had been re-vaccinated in 1901 or 1902. The boy, aged 16, who was half-witted, was employed on the farm to drive the pony and generally to look after it, and beyond carrying pails from the milking sheds to the dairy, he had nothing to do with the cows. This boy became ill on June 9 or thereabouts, with an inflamed eyelid. The first symptom he complained of was difficulty in swallowing, due apparently to enlarged glands at the angle of the jaw. When seen by me on June 16, the left upper eyelid was much swollen and deeply congested and œdematous (fig. 3). The seat of inoculation was evidently at the outer canthus of the upper eyelid, and the boy's medical attendant informed me that the original sore closely resembled a re-vaccination mark. The boy had been vaccinated in infancy. On June 17, I examined the pony which was under the charge of the boy, and found that



FIG. 2.—Mrs. "K." Photograph taken twelve days later than preceding picture. The resulting scab is about to separate.

above the coronet on the hind legs there were small circular sores which were scabbed over. These extended above the fetlock, one leg being much more affected than the other. The sores were not many and were healing. The farmer was quite unaware that this pony had anything the matter with it. In the stall next to this pony was one of the farm horses. On examination, I found this horse had a similar eruptive disease on both hind legs; small sores were discharging a yellow serous fluid into the long hair above the hoofs. The eruption extended from the coronet above the fetlock almost to the hock. The disease was acute, both legs were hot and swollen. The other horses were out at work and not available for inspection at that time, but the farmer examined them on their return from work and found they were then unaffected. Later, certain of these horses became affected and I had opportunity of examining them. The eruption was not limited to the hind legs; three of the horses had all four legs affected; but the eruption was much less extensive on the fore than on the hind legs. It did not extend above the hocks. The nasolabial mucous membrane was not seen to be affected, and the eruption was not

generalized over the bodies of the animals. Owing to the lower part of the legs of the cart horses having long hair into which a viscid and yellowish serum or lymph had exuded copiously, matting it together, it was difficult to determine the exact nature of the eruption. Moreover, the irritation of the eruption caused the horses to rub one leg against the other, and in this way the character of the eruption was interfered with. But circular sores could be made out about the size of a pea.

Whether the boy inoculated himself by rubbing his eye when he had the virus of "cow-pox" or of "horse-pox" on his hand, can only be a matter for conjecture. It is worthy of note that one of the assistant carters who helped the boy in grooming the pony likewise assisted in milking the cows, and had sores on his hands, and that the "cow-pox" in



FIG. 3.—Photograph of the boy "A" at "Z" farm taken about ten days after inoculation of the eyelid by either "cow-pox" or "horse-pox."

the cows and cow-men was antecedent to the farmer, boy, pony and horses developing the malady.

From material collected by me on June 16, from the contents of two primary vesicles on a teat of a cow (fig. 4) just attacked at this farm, Dr. Blaxall produced an eruptive disease on a calf and rabbits which he regarded as undoubtedly "cow-pox" or vaccinia. Subsequent vaccination of the calf in the usual way with current lymph of known activity completely failed to take, and the vaccinous material collected from the rabbits when used for the vaccination of another calf and other rabbits produced results coinciding with those induced by current lymph. Later observations showed that rabbits vaccinated with the material obtained from the cow at this farm or with its removes were immunized to subsequent inoculation with the material (or its removes) obtained from the horses, and vice versa; and hence it appears

that each material produced the same disease, but in different animals; that is, that the cow-pox and horse-pox were one and the same thing.

From the first cart-horse affected I succeeded in removing a vesicle from the leg just above the fetlock, and with this, rubbed up in sterile glycerine and water in the usual way, Dr. Blaxall inoculated a bull calf and three rabbits. As a result, only slight crusts formed on the rabbits, and this, treated in the usual fashion, produced no effect on other rabbits. On the calf the lines of incision showed only slightly raised crusts, except on the scrotum, where several small vesicles resulted. The contents of these vesicles were collected, and a second calf inoculated; small vesicles appeared on the lines of incision, and from their contents a third calf was inoculated. The vaccinia produced in this third calf was in character more typical of that which follows inocula-



FIG. 4.—Photograph of the udder of a cow on "Z" farm showing cow-pox lesions, from scrapings of which typical vaccinia has been produced in calves by Dr. Blaxall at the Government Lymph Establishment.

tion of the calf with the current lymph of the station, and the lymph collected from this calf produced characteristic vesicles on other calves, and ten months afterwards, having been kept in cold store during the interval, produced characteristic vesicles on rabbits. Subsequent revaccination of the first and third calf failed to produce vaccinia. Dr. Blaxall points out that the passage through the calf of the material obtained from the horse increased its virulence,¹ for whereas the original material failed on rabbits, that which had been passed through the calf took well; and that calves being more susceptible to vaccinia than rabbits, the fact that this horse material should take in the first instance but slightly on calves and fail on rabbits is only what might be expected.

¹ A similar manifestation is described by Dr. Blaxall. See "Report on Equine Variola," by Dr. Frank R. Blaxall, p. 568, Appendix C, Report of the Medical Officer of the Local Government Board, 1901-2.

At one farm visited, where the cows and milkers were affected, a lad aged 18, a milker, had first noticed a sore place over the first phalangeal joint on the dorsal aspect of the ring finger of his left hand. This gradually developed until it assumed the appearance of a vaccination vesicle; the lymphatics of the arm became inflamed and the axillary glands enlarged and painful. About four days after the sore on his finger was first noticed, another vesicle began to form at the inner canthus of his right eye, and the glands at the angle of his jaw became enlarged. In addition, three vesicles appeared on the dorsum of his tongue; all these vesicles were regarded by his medical attendant as typical of vaccinia. Most probably this lad was first inoculated with cow-pox on his finger, and then transferred the infective material either from his affected hand or directly from an infected cow, to his eyelid. The inoculation of his tongue could be accounted for by his licking or sucking the sore on his finger. At the time this case was under review, no material for experimental inoculation could be obtained from the milkers or from the cows.

During the inquiry, illustration was afforded of the fact that in a district where cow-pox is known to exist, eruptive affections of the hands of milkers merit careful inquiry before they can be accepted as resulting from inoculated cow-pox. I received a telegram from a medical practitioner stating that there was a well matured case of cow-pox in a milker at a certain farm, and on visiting the farm I found a young married woman, aged 23, employed as a milker, who had a large vesicle on the wrist at the base of her left thumb, and a smaller, evidently secondary vesicle, on the inner side of the same thumb. Inflamed lymphatics stood out distinctly on the forearm and arm, the lymphatic gland at the elbow was enlarged and painful, and the glands in the axilla were affected. The appearance of the vesicle was so like that of the vesicle which follows inoculated cow-pox that at the time I considered that the woman had indeed been so inoculated. However, I failed to detect any eruption on the teats or udders of the sixty-four milch cows on this farm. I had opportunity of examining six of the seven milkers employed at this farm, and none of these had any affection of the hands. The woman had not been vaccinated since infancy, and no inmate of her home or at the farm had been recently vaccinated. Three weeks later the local public vaccinator at my request vaccinated this woman with the current calf lymph obtained from the Government Lymph Establishment, and eight days later four well-marked vesicles resulted. The case was kept under observation for some days, and the vesicles were seen to pass through the normal stages of a successful vaccination.

Material from the primary vesicle on the woman's wrist was submitted to Dr. Blaxall, and when inoculated by him on a calf, though setting up a certain amount of reaction, failed to produce anything typical of vaccinia; a sub-inoculation on another calf failed entirely. Attempts to vaccinate rabbits with the original material also failed.

Once cow-pox is introduced into a herd of milch cows, almost every animal in the herd becomes affected. That the progress of the disease may be stopped by taking suitable precautions is illustrated by the following case:—

On examination of the thirty milch cows at a particular farm, two, which had been but recently imported into the herd, were found to have eruptive disease of the teats and udders. The shed in which they stood contained thirteen cows, and two of these cows, other than the two manifestly affected, showed signs suspicious of like disease in an early stage. The suggestion was made to the farmer that the thirteen cows in this shed should be kept separate

from the remainder of the herd, and that those affected should be milked after the others, that the milkers should wash their hands in a solution of permanganate of potash both before and after milking each cow and that the teats and udders of the cows should be dealt with in like manner. These preventive measures proved effective, for the farmer writing to me at a later date stated that the two cows first affected were practically well and that the only cow which had showed signs of eruption on the udder was one of the two cows regarded as possibly having the disease in an early stage on the day of my visit.

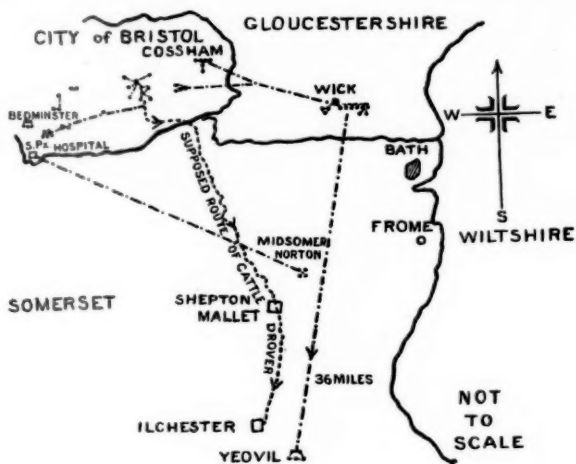


FIG. 5.

SUMMARY OF THE 1909 INQUIRY.

The inquiry, undertaken in June-July, 1909, extended to fourteen farms, all of them reputed to be suffering or to have recently suffered in their herds or in the persons of their milkers from disease of the nature of cow-pox. These farms, situated in seven sanitary districts, were scattered over upwards of 100 square miles of country and the "cow-pox" affecting them was found to have been so nearly simultaneous in occurrence as to preclude, except in a minority of instances, explanation by transference of infection from farm to farm.

Other points of interest noted were the following:—

(A) The high proportion of cows attacked at farms which by the date of visit had been invaded and the high degree to which milkers suffered infection. Thus, the eleven rural farms which by July were suffering or had recently suffered disease of the nature of cow-pox, comprised 410 cows, of which 214 (52·2 per cent.) had been attacked. And these farms employed as milkers forty-four persons, of whom no less than twenty-three (52·3 per cent.) became infected through the attendance on farm animals. Almost without exception it was not until the cowmen became infected or indeed incapacitated, that the attention of the farmer was directed to the malady among the cows.

(B) Though the precise nature of the disease among cows or cowmen could not, owing to its advanced stage at the date it came under skilled observation, be

determined for many of the farms, in certain instances it was found by Dr. Blaxall's experimental procedures to be unequivocal cow-pox. For instance:—

(C) At a particular farm in which forty out of forty-three cows became infected, five out of six farm horses and a single pony suffered concurrently or in sequence from "equine-pox," and six out of the seven milkers, and the boy who was in sole attendance on the pony, likewise suffered from a malady not distinguishable from cow-pox. On experiment by Dr. Blaxall, in the case of one of these cows and certain of the cart-horses, material collected from their sores yielded undoubted vaccinia.

(D) On the other hand, in the case of another farm, material from a sore on the hand of a female milker, who was regarded locally as suffering from unquestionable cow-pox, was not found by Dr. Blaxall to yield vaccinia; and this woman, on subsequent vaccination with the current lymph of the Government Lymph Establishment, proved fully susceptible to vaccinia conveyed in ordinary fashion. None of the other six milkers, nor sixty milch cows, at this farm showed signs of cow-pox.

In the circumstances, the question of source or sources of the cow-pox was of primary and special interest.

Recent small-pox of the human subject as a source of infection of the infected herd could not be traced in any instance. Except in a single sanitary district of the wide rural areas in question, no small-pox had been notified during several years, while in the case of the particular district in which small-pox had been imported into a single family not long before cow-pox made its appearance on a neighbouring farm, no sort of relation could be traced between the small-pox and persons or cows on the farm in question. Nor was there evidence at all suggestive that cowmen suffering from local sores on their hands had in this way introduced infection into any herd; cowmen without exception suffered, when they did suffer, in sequence to cows on which they attended. In a few instances, appearance of cow-pox in a herd was consistent with introduction of the disease through additions of some recently purchased cow or cows. But in the majority of instances the beginnings of the cow-pox could not be thus explained. If it were permissible to consider cow-food as a possible agent and distributor of cow-pox, the simultaneous invasion of many herds over a wide tract of country such as that here recorded, might perhaps lend itself to readier explanation.

Inquiry was made in this direction, and it was ascertained that oil cake in sacks had been received during the spring at several farms, and that this cake had come from Bristol.

This naturally directed attention to the outbreak of small-pox in Bristol and its neighbourhood, and for the following particulars I am indebted to Dr. Davies, Medical Officer of Health of that city.

In December, 1908, after the city had been free from small-pox for a year, a corn porter living at Bedminster was attacked by the disease. He was at work within the incubation period on a steamship that had come from Mariupol, Sea of Azov, and was discharging grain at Portishead. He developed a mild attack of small-pox on December 14 and was removed to hospital, whence he was discharged as cured on January 23. No other case of illness is known to have occurred on board the vessel. Before the first patient had left the hospital, a man living in another part of the city sickened on or about January 11. In this instance, although no direct communication could be traced, the lapse of a double incubation period (2 by 14 = 28 days) suggested causation through an intervening "missed" infection. This second patient travelled freely about the city before the nature of his illness was recognized. From this case two more in a common lodging house received infection. Other cases occurred in which the original source of infection could not be ascertained, and

the infection was carried outside the city. The first case in Cossham was a man who worked at a mill where part of the consignment from the Bristol ship was delivered, so that his infection may have been derived from infected sacks rather than from secondary infection through a "missed" case. A family group of cases in Bedminster were relatives of the mill-owner.

The infection was of a virulent kind. Out of thirty-two city cases, six were hæmorrhagic at onset or later; the infection was distributed and it is recognized that there must have been several "missed" cases. In all, some sixty cases were known to have occurred in the city and in the country round about.

A cattle drover who had been in contact on March 31 with one of the Bristol cases of small-pox left Bristol on April 10 with a flock of sheep, and travelling south apparently skirted Midsomer Norton and passed through Shepton Mallet to Speckington, Ilchester, returning to Bristol on April 19. His exact route could not be ascertained (fig. 5).

While I am of opinion that this outbreak of cow-pox was in some way connected with the recently antecedent small-pox in Bristol and its neighbourhood, I am fully aware that I failed to trace any direct connexion. The exigencies of the public service necessitated my being recalled for work of more urgent character and the inquiry had to be abandoned.

In the years 1917 to 1920, inclusive, 588 cases¹ of small-pox are known to have occurred in England and Wales in 123 different sanitary districts. In no instance has there been any extensive spread of the infection except last year at Middleton, in Lancashire, where some eighty cases occurred in connexion with cotton mills. The disease was extremely mild and no deaths occurred. The infection was probably conveyed by cotton imported from America. In these years there has been no spread of small-pox to rural districts nor to persons whose daily occupations would bring them into close contact with cattle.

The absence of knowledge of cow-pox in dairy farms in England at the present time is not, I imagine, due to the disease being unrecognized when it occurs, but to the fact that it is non-existent.

DISCUSSION.

Professor W. J. SIMPSON said that the details and information given in Dr. Blaxall's very able paper would be invaluable to those engaged in the preparation and storage of calf lymph in our tropical colonies, and he hoped that when the paper was published it would be available for them. In East Africa recently there was a failure in potency of vaccine due to defective technique and other causes, and at his suggestion the Colonial Office called a conference, at which Dr. Blaxall gave most useful advice. In regard to the tendency of vaccines to degenerate, this was found to be much greater during the rainy season in Calcutta than at other times. It was the same with small-pox infection. If pilgrims arrived in Calcutta from the Hedjaz in the rain there was little danger of small-pox spreading, even where those suffering from the disease were placed under the most favourable conditions for its spread. But if they arrived with small-pox at any other season it was different. The use of clove oil for the removal of extraneous organisms would, he thought, be welcomed by the medical officers in charge of the vaccine substitutes in the tropics. As a preservative in hot climates and for long transport distances pure lanolinized lymph, which was introduced many years ago into India by Colonel W. G. King, C.I.E., proved much more successful than

¹ Excluding cases reported from Port Sanitary Districts.

glycerinated lymph. Professor Simpson's interests had always been attracted to the relationship of small-pox in man to that of animals, and to the difference of virulence of small-pox in different parts of the world. In the eastern type, for example, the case mortality in the unvaccinated was from 60 to 70 per cent. In the middle east and west it was roughly among the unvaccinated from 20 to 40 per cent., while in recent epidemics in South Africa, America, West Indies and Australia the case mortality had been very low. Confining his attention only to the great variation in type, he was inclined to think that the type depended on the animal source from which the particular infection was derived. He was of opinion that in those endemic centres of small-pox where there was a lull between the epidemics the infection still existed in the locality, but that the disease was prevailing among some of the lower animals without necessarily producing in some of these an observable pustular disease, and accordingly not recognized. Lately he had been experimenting on rats, when he could obtain small-pox material, which was very seldom, and the experiments so far appeared to justify this view, and to indicate that some at least of the lower animals might suffer and die from small-pox without showing pustular eruptions. Much more, however, required to be done in this direction with controls, &c., when small-pox virus was available, which was not the case at the present time, before the validity of this theory could be established.

Dr. D. S. DAVIES (Bristol) expressed the interest with which he had listened to Dr. Reece's paper on cow-pox in relation to the 1909 small-pox outbreak in Bristol and neighbourhood, of which he retained a vivid impression. The circumstances of the outbreak as set forth in the paper were substantially correct, and he agreed with the reasonableness of the conclusions.

Dr. S. MONCKTON COPEMAN, F.R.S., said that as he was originally responsible for the demonstration of the selective action of glycerine in the elimination of "extraneous" bacteria from vaccine lymph, and thus also for the introduction of "glycerinated lymph," he was naturally interested in the fact that the method adopted for its manufacture at the Government Lymph Establishment still remained substantially the same as that suggested in his earliest papers on the subject published in the *Proceedings of the International Congress of Hygiene and Demography* in 1891. Continued research by Dr. Blaxall and his colleagues had, however, enabled them of late years to enhance the bacterial effect of the glycerine by the addition to the vaccine emulsion of a minute quantity (0.1 per cent.) of oil of cloves; whilst the installation of an efficient system of cold storage had rendered possible the keeping of stocks of lymph for practically any length of time and in quantity sufficient to meet any emergency. Referring to Dr. Reece's paper, he thought that everyone who had investigated the subject must agree with him that cow-pox was now a comparatively rare disease, whereas a century or more ago, if one might judge from contemporary records, it would appear to have been of fairly frequent occurrence. The reason for this, as indicated in a paper communicated by him to the Royal Society, might probably be explained by the fact that, whereas the bovine animal was practically insusceptible to infection, experimental or otherwise, from human small-pox of the ordinary variety, it was quite easy to convey the *inoculated* form of small-pox to the cow or calf. This being so, the comparative frequency of the occurrence of cow-pox as described by Jenner and his contemporaries could be understood. Consequently also, when cow-pox broke out in a dairy farm at the present day, they were not unlikely to "draw a blank" in seeking to connect it directly with some coincident outbreak of human small-pox. A much more probable source, in his opinion, was the cow-pox intentionally inoculated on the human subject in the form of the special vaccinations or revaccinations likely to be carried out as a preventive measure during prevalence of small-pox.

Section of Epidemiology and State Medicine.

President—Dr. A. K. CHALMERS.

Sporadic Outbreaks of Plague in the Union of South Africa.

By L. G. HAYDON, D.S.O., M.B., C.M., D.P.H.

(Assistant Health Officer, Union of South Africa.)

SINCE January of 1916, occasional cases or small groups of cases of plague have been discovered at irregular intervals in the Orange Free State and neighbouring districts occurring under circumstances which did not, until recently, disclose the method of the spread of infection.

The number of cases and the circumstances under which the outbreaks occurred have from time to time been officially declared. In previous years, well defined epidemics of the disease had occurred at the ports and larger towns in connexion with well proved epizootics in the "domestic" rat population and following the courses of transit of grain and other food stuffs in the usual way. These epidemics were satisfactorily dealt with by campaigns against the "domestic" rodents and the other usually effective methods.

The occurrences since 1916 have differed in character from these well-defined epidemics in the following particulars:—

(1) The outbreaks were confined to persons or small groups of persons living in rural areas less densely populated than the bulk of South Africa, and remote from larger towns and villages.

(2) Investigation and the closest inquiries failed to elicit the existence of "domestic" rodents at or anywhere near the scene of the outbreaks. The nature and structure of the farm houses and native huts in which many of the cases lived was not such as to favour the existence of domestic rodents.

(3) The time intervals between adjacent groups of cases was irregular, being in some instances a few weeks, and in other instances as much as many months. The distances between the scene of such outbreaks as would at first sight appear to have a common source of infection were in some instances as great as fifty miles, the intervening population remaining unaffected and the closest investigation failing to elicit any connexion, personal or through verminous fomites, between the groups of cases. Many of the cases occurred in persons living on isolated farms of several thousand acres, and having limited intercourse with their neighbours.

The Central Health Department was faced with the problem of discovering either the source of infection common to these outbreaks or the means of transference of infection from one case or group of cases to the next, over varying intervals of time and space in the unusual circumstances stated. The theory tentatively held, that latent infection could remain in ambulatory human cases to reappear and be passed on in virulent form after a considerable interval, had under the circumstances to be revised. As the series of small detached outbreaks continued to occur up to 1921, Dr. Mitchell, the Secretary for Public Health, decided to have close investigation made into the species, habits and morbidity (if any) of the wild rodents of the affected area: and for that purpose enlisted the aid of experts trained in the capture and classification of African wild animals. The following results were arrived at in the early months of 1921:—

(1) The area of country involved, with a radius of about 150 miles, may be roughly described as flat, or as gently undulating plains, intersected by water-

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courses which only contain flowing water for a few months of the year, but in the valleys of which occasional pools may remain longer.

These valleys are fringed with low scrub and vegetation varying from a few to several hundred yards in width. The soil generally is a light sandy loam. The indigenous vegetation is grass, patches of low scrub, wild melons and cucumbers and the like which usually grow in such latitudes in plains with scanty rainfall.

The area is divided into farms of from one to five thousand acres, and is mostly concerned with the raising of sheep and the production of maize and other cereals.

The human population, both white and native, is very sparse and widely separated. The conditions generally favour the existence of the smaller wild animals, especially rodents, which find harbourage by burrowing under the roots of grass and the low scrub.

(2) The animals captured were as set out in the following list:—

Common name	Name as determined by an official of the Transvaal Government Museum
Gerbille or Gerbil	<i>Tatera Lobengula</i>
Large-eared mouse	<i>Malacothrix Typicus</i>
Fat mouse	<i>Steatomys Pentonyx</i>
White-tailed mouse	<i>Mystromys Albicaudatus</i>
Tree mouse	<i>Dendromus Melanotis</i>
Dwarf mouse	<i>Leggadia Deserti</i>
Striped field mouse	<i>Rhabdomys Pumilio</i>
Multimammate mouse	<i>Rattus Coucha</i>
Namaqua rat	<i>Rattus Namaquensis</i>
Golden rat	<i>Rattus chrysophilus</i>
Ground squirrel or Meerkat	<i>Geosciurus Capensis</i>
Spring hare	<i>Pedetes Caffer</i>
Yellow hare	<i>Lepus Ochropus</i>
Kolhaas	<i>Lepus Zuluenensis</i>
Red hare	<i>Pronolagus</i>
Suricate	<i>Suricata</i>
Slender mongoose	<i>Galerella caani</i>
Yellow mongoose	<i>Cynictis penicillata</i>
Mnishond	<i>Ictonyx Striatus</i>

(3) Considerable difficulties were encountered in their capture and in the investigation of their habits, owing to the fact that many of them are strictly night animals and burrowers, necessitating the careful tracking of small spoor in the early mornings to and from water holes and feeding places. The burrows are often of considerable depth and extent, branching in several directions, while the ordinary heap of earth for which one looks as indicating a burrow inlet may be absent, the earth removed in burrowing being used to block up the passage behind the burrower. Entrances and outlets may be numerous and carefully concealed under overhanging bunches of grass or bush. It was, moreover, found to be a common habit of some of these animals to occupy the burrows of animals of different species, and it was no uncommon matter to find the carnivorous mongoose and some of the smaller non-carnivorous rodents inhabiting the same series of burrows without detriment to the latter: it should be remarked, however, that in such instances the carnivore would be a day feeder, while the non-carnivores would be night-feeders.

(4) The procedure devised in attempting to discover the presence or absence of sickness or mortality due to plague infection was to commence tracking and digging-out operations close to the localities in which human plague cases had resided or (what was subsequently found to be equally important) in the immediate vicinity of places in which the human cases had been engaged in agricultural occupations such as ploughing, herding sheep, or camping for meal times. It was found important also to extend the area of

operations rapidly and widely, because in the early investigations the burrows in the immediate vicinity of the residence or work place of the human cases had been found to be deserted by animals and fleas, or at most to contain only a few shrivelled remains of their former occupants, from which it was impossible to determine the presence or absence of plague infection.

As a result of very zealous and painstaking work, conducted on these lines, extensive sickness and mortality due to plague among some of the smaller species of rodents were at last discovered.

The procedure for verifying the nature of the infection and the safeguarding of the experts and their native labourers from the danger of flea-carried infection while engaged in laboriously exploring the ramifying burrows and the rodents' nests presented some initial difficulties. Owing to transport difficulties it was considered impracticable to make use of a field laboratory.

Arrangements were eventually made whereby a supply of ice and containers was kept constantly at hand for the transport without putrefaction of animals recently dead, to a central laboratory for diagnosis, and as regards the danger from fleas, which were found in abundance, the use of insecticides, both personally and otherwise, was practised before the bodies or nests of rodents were handled.

The animals so far proved to be plague-infected and to show a very heavy mortality over a wide area are the following:—

(a) Gerbille, or *Tatera Lobengula*, a rodent slightly larger and somewhat similar to the domestic brown rat.

(b) Multimammate mouse, or *Rattus Coucha*, a rodent somewhat similar in size and appearance to one of the ordinary domestic mice.

These two are thought to be perhaps the commonest of the animals contained in the above-given list (p. 28), in the area of country under consideration, and they undoubtedly exist there in very large numbers. Burrows containing one or the other, and more often both species, extending in what may roughly be described as chain formation with occasional gaps, have been traced almost throughout the whole area.

Both are animals which only venture out at night, and this fact and their habit of closing up the entrance passages of their burrows, may account for the failure of the earlier investigations and inquiries as to the presence of rodents in or near residences affected by plague.

Both feed commonly on the young roots of vegetation, wild melons and the like, and both eat grain occasionally and when pressed for food. Neither lives in farm houses or natives' huts, but the multimammate mouse is inclined to live in closer proximity to human habitations than the gerbille, and its burrows have occasionally been located by an expert in the back yards of farm houses and close to the walls of native huts. Provisionally, then, this species may be accepted as being the common conveyer of infection to man in the area in question, but an instance has occurred in which the evidence definitely points to human infection acquired from a gerbille burrow remote from human habitation. The person infected had been accustomed to sit daily for his mid-day meal on a spot honeycombed with gerbille burrows—from which, subsequently, definite evidence of gerbille infection was obtained.

None of the other animals mentioned in the above list has been found so far to be plague-infected, but the numbers of these captured and examined have been small and no experiments have been so far made to ascertain their susceptibility to plague.

(5) Several means have been attempted to destroy these rodents, but the methods ordinarily applicable to "domestic" rodents are not generally

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practicable, owing to the vast areas involved, and to their habits of feeding and burrowing.

Poisoning on a large scale appears to be inapplicable having in view the nature and easy accessibility of their principal food. The use of sulphurous and arsenical vapours, either with or without special apparatus, met with scant success owing to the closure of burrow passages and the branching of the burrows. Where the entrances of burrows have been discovered and cleared some success has been obtained by the use of carbon bisulphide in each opening, and the subsequent closure by turf. On subsequent excavation, all occupants have been found dead, and the fleas, both on the rodents and in their nests, have been found in a more or less inactive state. The fatality to fleas is not so marked as the fatality to their hosts, and a dose of the vapour which destroys all rodents leaves a fair proportion of their fleas in a condition from which they recover. Trapping or systematic digging out in such an area is too vast a work to be seriously considered.

There remains for consideration the possibility of providing or increasing their natural enemies, or of discovering and spreading a disease among them which is not fatal to human beings.

(6) A careful collection of fleas and other ectoparasites found on each animal captured or found dead, and in the underground nests, was made. The results of their classification will be declared in due course. No experiments have hitherto been made to discover which of the varieties found are capable of transmitting the bacillus, but it may provisionally be assumed that the carriage of infection from rodent to rodent and from rodent to man has been effected in this area by one or other of the varieties found.

(7) From the circumstances here described, and from the observations of experts on the spot, more especially from the discovery of large areas of rodent burrows entirely depopulated and containing only a few shrivelled remains, it appears probable that plague infection almost annihilates gerbilles and multimammate mice in any particular series of burrows infected, and that the epizootic extends slowly across country in an irregular manner through chance visits of animals to burrows in the vicinity of their own dwellings, while a sufficient number may escape death to bring about a repopulation when the period necessary for the death of the ectoparasites in infected burrows has elapsed.

Human infection from fleas which have deserted the dead rodents and their nests has been only an occasional occurrence, and has been commonest in those engaged in outdoor pursuits.

The area involved produces cereal food stuffs and forage, which are sent in to the towns; therefore, as long as wild rodent infection exists in it, there must be faced the problem of how to prevent (a) the transference of infected fleas or rodent remains from the collecting centres and rail heads; (b) the extension of the town or domestic rat population to the area in question, as well as the task of the general curtailment of the domestic rodent in the towns and ports.

The information obtained in these investigations appears to tally in some respects with the reports of infection of wild rodents by observers in other countries, so well collected and set forth in Dr. Bruce Low's last report on the progress and diffusion of this and other diseases throughout the world (1914-17). And it may further help to elucidate certain problems as to the existence of latent foci of infection remaining perhaps almost unnoticed in remote rural areas, from which at intervals—and dependent on the extent and vulnerability of the domestic rat population—a serious epidemic affecting human life and trade may arise, traversing the routes of the transit of grain and other food stuffs.

Section of Epidemiology and State Medicine.

President—Dr. A. K. CHALMERS.

Metabolism and Disease.

By J. PARLANE KINLOCH, M.D.

VARIOUS theories have been advanced as an explanation of the causation and course of epidemics of disease following the development of knowledge as to the causes and natures of fevers and of the principles of treatment and prevention. Of such explanations, the one that would appear to have done most to explain many of the complexities of epidemiology, is that advanced by Brownlee [1], who concludes that the organism responsible for an epidemic suddenly assumes great reproductive or infective power, a storing up of energy having gone on till the point of liberation is reached, and then the powers of infectivity or reproduction continuously decrease, the process being a rhythmic one of increase and decrease in the disease organism. A similar biological activity is expressed in somatic life by periods of specially quick growth followed by periods of rest. In germinal life it expresses itself by epochs of increase and energy. This rhythmic process of increase and decrease manifests itself in the minute animals and vegetables that cause disease as recurrent epidemics of disease. Brownlee also discusses another view that has been advanced, namely, that epidemics are controlled by the exhaustion of the susceptible persons among the population. If this theory held good, then the decline of an epidemic would be much more rapid than its rise, and this is not so in the vast majority of recorded epidemics. Not only so, but after the disappearance of an epidemic of a disease such as measles, to which practically everyone is born susceptible, child after child is found who has meanwhile escaped infection.

Again, it has been maintained that epidemics depend on a diminished resistance of the population to disease, and it is generally admitted that so far as certain individual infections are concerned, there is evidence that may support this theory. Thus, there is reason to believe that as a result of burns the resistance of the body is lowered to the infection of scarlet fever. There is reason also to believe that certain gastro-intestinal infections such as cholera and enteric fever most easily invade the body in the morning before food has been taken, when the stomach is alkaline after the night's rest, and so the disease organisms evade the destructive action of the acid gastric juice. This view is of some historical interest in so far as it is reminiscent of the British criticism of the specificity of Koch's cholera vibrio.

Hay [2] pointed to the stomach's morning alkalinity as an explanation of the apparent discrepancy, but that did not prevent the appointment of the British Commission that endorsed Koch's work. The modern view as to the influence of eating of fruit on the incidence of choleraic infections is based on the same idea—in this case a disturbance of gastric function. But while these examples serve to explain cases of individual infection, they afford no evidence of any factor capable of increasing the susceptibility of the general population to disease.

Every epidemiologist, however, is aware that a vast mass of statistical information is available concerning the incidence of disease and death that presents problems the solution of which must be dependent on further knowledge. The figures concerning general death-rates, comparative mortality figures, infant mortality, zymotic death-rates and tuberculosis death-rates, are everywhere available, and the complexity of the factors responsible for them is recognized, and the following figures of a single community are submitted only to serve as a text, while at the same time they eliminate the difficulty presented by regional distribution.

In the table submitted, a comparison is made of birth, death and disease rates in three different types of wards in the City of Aberdeen. Rubislaw gives the data for a west-end population of the better class; Torry data for a working-class population living in modern tenements under good sanitary conditions and in regular and well-paid employment; Greyfriars a poor population living in somewhat dilapidated property. The 1911-12 figures were submitted by Hay to the Royal Commission on Housing in Scotland. The year 1917 gives figures for the war year in which cost of living, as compared with the average wage, appears to have been highest [3]. The 1920 figures give post-war data (see table on opposite page).

The table shows that Rubislaw and Torry give similar results from a health point of view, with, however, a balance in favour of Torry in respect of the much greater surplus of births over deaths. Greyfriars shows a distinctly worse record than Torry, its death-rate being substantially higher. The same is roughly true of the three wards with reference to their zymotic and tuberculosis death-rates. The figures give no evidence of any malign effect of problematical strain due to war conditions in 1917. In that year the birth-rate is noticeably lowered. Healthy adults are on Service, and it is doubtful if nutrition was impaired among working-class women and children. (In this connexion a comparison of German and Austrian statistics with British statistics was intended, but the figures have not been available.)

With regard to such figures, it has long been known that it is the house itself that connotes the incidence of disease and death rather than density of population per acre, and much statistical information is available in every town to emphasize this fact. Thus, in Aberdeen, the deaths in one-roomed houses are 25 per 1,000; in three-roomed houses 11 per 1,000; the infant mortality in houses of three rooms and under is considerably more than twice as high as the mortality in houses of five rooms and upwards; the death-rate from tuberculous disease as a whole is more than twice as high in houses of four rooms and under compared with what it is in houses of five rooms and upwards; if the zymotic death-rates are analysed according to size of house, even more striking results are obtained (see Charts 1 to 4, pp. 34 and 35).

These diagrams indicate clearly that with increase in number of rooms there is generally a marked decline in the case-mortality of zymotic diseases.

In the past the explanation of such figures has been attributed in a vague manner to a summation of influences induced by poverty and all that poverty implies. Such influences may be environmental or physiological, or both.

Instances of environmental contamination forming a vehicle for the conveyance of epidemic disease may be found in water-borne diseases and insect-borne infections, but do not explain recurrent epidemics. Conditions under which both environmental and physiological influences are involved would appear mainly to interfere with body activity, but the effect of such interference on the incidence of disease has not yet been proved. As an example of these combined influences, the work of Flügge [4] and Leonard Hill [5] may be cited, wherein it has been shown that the depressant effects of vitiated air are mainly dependent on interference with the heat-regulating mechanism of the body. The results of the chilling of local areas of body surface, and of the effects of noxious effluvia are simply not known.

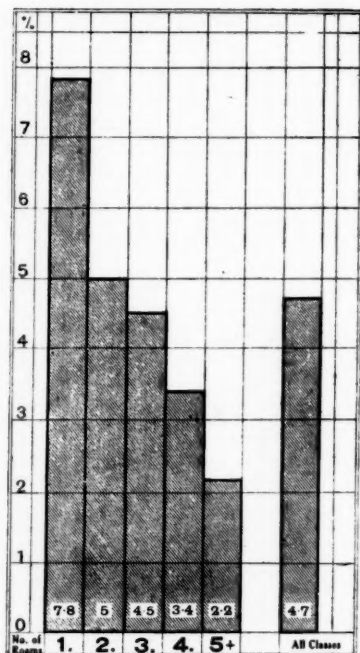
CITY OF ABERDEEN. BIRTH- AND DEATH-RATES IN THREE TYPICAL WARDS OF THE CITY.

	Year	England and Wales	Scotland	City of Aberdeen	WARDS		
					Rubislaw	Torry	Greyfriars
Population ...	1911-12	36,305,064	4,746,105	163,891	20,210	11,428	13,850
	1917	—	—	160,938	19,845	11,222	13,600
	1920	—	—	159,461	19,664	11,119	13,475
Birth-rate ...	1911-12	24.1	25.8	25.0	16.2	32.5	34.1
	1917	17.8	20.1	17.8	10.2	25.6	24.9
	1920	—	—	30.3	16.0	36.6	44.0
Death-rate from all causes (per 1,000 of population)	1911-12	13.95	15.2	15.4	16.2	11.4	16.3
	1917	14.4	14.3	14.7	11.5	12.1	23.0
	1920	—	—	14.9	11.7	13.2	19.7
Infant death-rate (deaths under 1 year per 1,000 births)	1911-12	113	109	133	83	115	170
	1917	96	108	139	84	150	204
	1920	—	—	121	70	118	165
Excess of birth-rate over death-rate	1911-12	10.2	10.6	9.6	6.0	21.1	17.8
	1917	3.4	5.8	3.1	-1.3	13.5	1.9
	1920	—	—	15.4	4.3	23.4	24.3
Death-rate (per 1,000 of population) from—							
Zymotic diseases	1911-12	1.0	1.1	1.5	0.8	1.6	3.1
	1917	0.9	1.1	1.2	0.7	1.3	2.3
	1920	—	—	1.0	0.5	1.3	1.0
Pulmonary tuberculosis	1911-12	1.1	1.2	1.1	0.6	0.6	1.3
	1917	1.2	1.1	1.2	0.6	1.2	2.0
	1920	—	—	1.0	0.7	0.8	1.1
Other tubercle...	1911-12	0.3	0.6	0.4	0.2	0.4	0.7
	1917	0.4	0.5	0.6	0.2	0.4	1.0
	1920	—	—	0.3	0.2	0.1	0.4

A purely physiological influence is to be found in the nutritional requirements of the body. The diet of the very poor has been investigated in many cities, notably in the Physiological Laboratories of Edinburgh and Glasgow

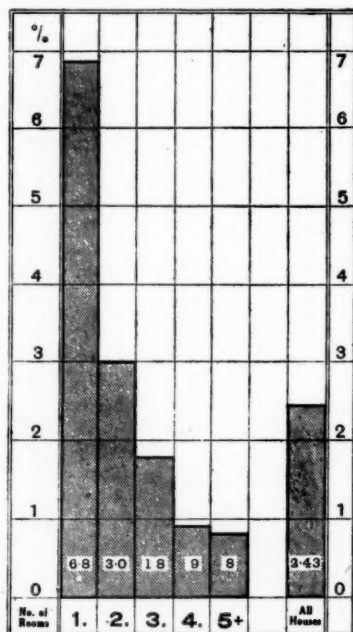
Universities. In a report issued in 1913 from the Physiological Department of Glasgow University, figures are given that show that while labouring class families with a regular income of over 20s. a week manage to secure a diet approaching the proper standard for active life, those with a smaller income and those with an irregular income entirely fail to get a supply of food sufficient for the proper development and growth of the body or for the maintain-

CHART 1.



Cases	1,174	7,564	3,837	1,079	1,354	15,008
Deaths	92	385	174	37	30	718

CHART 2.



Cases	1,067	11,464	6,779	2,046	2,675	24,031
Deaths	73	348	122	19	22	584
Average No. of Inmates	4.1	5.2	3.8	6.2		

Number of cases and deaths dealt with in each class of house.

CHART 1, WHOOPING-COUGH.—Case mortality in different classes of houses (1892-1900).—LAING.

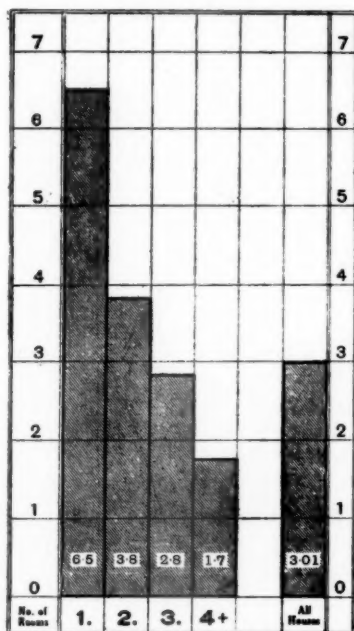
CHART 2, MEASLES.—Case mortality in different sizes of houses (1893-1902).—WILSON.

ance of a capacity for active work. Such investigations, however, again fail to indicate any correlation between diet and the incidence of disease.

The position, however, has changed recently, since new methods of investi-

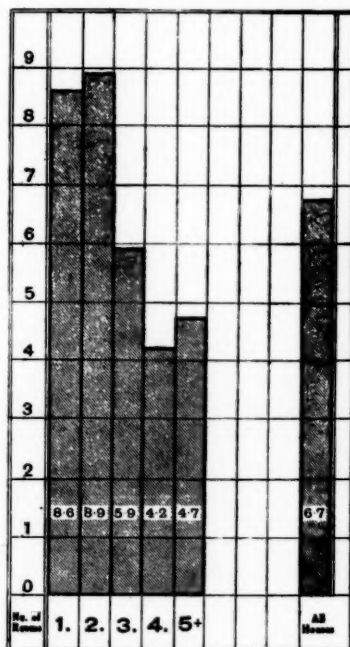
gating problems of nutrition have been developed. In the past, knowledge of nutrition progressed hand in hand with the science of chemistry, aided in so far as was permitted by nutritional investigations, such investigations being confined either to a general survey of the food requirements of a particular population or to the limited assistance that direct calorimetry with its complicated apparatus might provide. During the past few years, however, great

CHART 3.



Cases	431	4,334	4,088	3,493	12,846
Deaths	28	185	114	60	387
% Mortality	6.5	3.8	2.8	1.7	3.01

CHART 4.



Cases	197	2608	2272	737	1161	6962
Deaths	17	234	135	31	56	473

Number of cases dealt with in each class of house.

CHART 3, SCARLET FEVER.—Case mortality in different sizes of houses (1891-1909), per 100 cases notified.—NICOL.

CHART 4, DIPHTHERIA.—Case mortality in different sizes of houses, per 100 cases notified (1901-1914).—BROWN.

advances have been made as a result of the intensive application of the biological method to the analysis of foodstuffs, and the recent development of indirect calorimetry with its simple apparatus would appear to provide

means for the exact investigation of nutritional requirements of the widest description.

It has remained largely for McCollum and his co-workers to put the science of nutrition on a fundamental scientific basis as a result of their application of the biological method of investigation to the problem of the nutritional values of proximate principles of food. Had their work been accomplished before the investigation of the so-called accessory food substances or vitamins by workers in this country, much unfortunate controversy might have been avoided. The principle underlying indirect calorimetry is that by estimating the amount of O_2 taken in for the combustion of food, and by estimating the CO_2 given off when the combustion of the food has been carried to its end-point, it is possible to estimate the energy developed in the body by the food in question. The complete apparatus and method of calculation are as described by Cathcart [6]. The clue to the nature of the combustion is the respiratory quotient—i.e., the ratio of the output of CO_2 to the intake of O_2 . Thus with carbohydrates:—

$$C_6H_{12}O_6 + 6 O_2 = 6 CO_2 + 6 H_2O$$

$$\therefore R.Q. \text{ of CHO} = \frac{\text{Vol. } CO_2}{\text{Vol. } O_2} = \frac{6}{6} = 1$$

For fats the respiratory quotient is similarly calculated, e.g.—



$$\therefore R.Q. = \frac{102 \text{ Vols. } CO_2}{145 \text{ Vols. } O_2}$$

$$\therefore R.Q. \text{ for Fats} = 0.703$$

So also the R.Q. for proteins is found to be 0.801.

The expired air is collected in a Douglas bag, and the analysis done by Haldane's apparatus. The oxygen figures and the Zuntz values are employed in calculating the results. Basal metabolism is ascertained, the food consumed, and again the energy output is determined. In this way it is possible to ascertain not only the actual energy value of the entire food, but of its fat and carbohydrate content, the energy value of the protein being determined indirectly by urinary analysis. In an analogous manner the physiological cost of muscular work may be determined. This crude description of the indirect method of calorimetry is given here, since not only has a short method of estimating energy output by means of CO_2 determinations alone been described in the *British Medical Journal*, May 7, 1921, p. 669, by Dr. A. D. Waller and Miss G. de Decker, but an apparatus for that purpose has been put on the market. Objections to the validity of the short method have been raised by Leonard Hill and Campbell [7], and by Orr and Kinloch [8], and a reply to these objections has appeared in the same journal [9]. In view of the necessity of putting the results of indirect calorimetry on an accurate basis, and in view of the fact that the marketed apparatus is being used for clinical purposes and opinions formed on the results obtained, the publication of such work in current medical literature seems premature.

It has been well known for centuries that restricted diets have been responsible for producing disease in man. In former days the incidence of scurvy among sailors confined for long periods to a monotonous diet of salt beef and biscuits was rightly referred to the nature of the food, and it was well understood that rapid recovery took place when fresh fruit and vegetables were

made available. So also pellagra, as it occurred for centuries among the poor in certain areas in Europe, and beri-beri as it occurred among the poor in the East, have more lately been attributed to deficient diet. Funk [10], working on the fertile suggestion made by Eijkman, came to the conclusion that beri-beri was a disease due to the absence from the diet of a so-called "vitamin," and on suggestive chemical evidence attempted to account for scurvy, pellagra and rickets in a similar manner. Extensive investigations of these conditions have been made in recent years, the results of which are best interpreted in the light of what constitutes a diet adequate for the promotion of growth and the preservation of health as laid down by McCollum in his "Newer Knowledge of Nutrition" [11]. Briefly stated, the adequate diet must contain (1) proteins containing in sufficient amount all the amino-acids required to form tissue proteins; (2) carbohydrate; (3) fat; (4) inorganic salts of a nature and amount sufficient to provide for growth and to maintain health; (5) an unidentified fat-soluble substance named fat-soluble A, abundant in butter fat, egg yolk fats, liver and kidney fats, but widely distributed in leaves, seeds, fruits, roots and tubers, from whence animal life obtains it; (5) an unidentified substance soluble in water or alcohol named water soluble B, widely distributed in nature in seeds, leaves, fruit, roots, tubers, meats, eggs and milk, and which is never associated with fats of vegetable or of animal origin. The last two essentials, fat-soluble A and water-soluble B, cannot be regarded as growth-producing substances alone; they are as essential for the maintenance of health as for the promotion of growth. The presence in the diet of fat-soluble A also prevents the development of a pathological condition in the eyes of the nature of a xerophthalmia. Further, if xerophthalmia of dietary origin develops, administration of substances containing fat-soluble A cures it rapidly. The presence in the diet of water-soluble B prevents the development of beri-beri of dietary origin. If this polyneuritis develops, extracts containing water-soluble B cures it.

In view of the basic requirements of a diet adequate for the promotion of growth and the maintenance of health having been thus defined, it is necessary to revise current views as to the nature of several so-called deficiency diseases. Valuable information as regards scurvy has been obtained from a study of the experimental diseases in the guinea-pig. McCollum and Pitz [12] and Jackson and Moore [13] have observed that guinea-pigs suffer from scurvy not only when restricted to a diet of oats, but likewise when fed on oats and all the fresh milk they will consume. McCollum and Pitz point out that milk alone is a complete food and serves to maintain growth and a good state of nutrition in several species of animals, such as rats and swine. It cannot therefore be regarded as lacking in any unidentified food substance. In the guinea-pigs thus dying of scurvy, the cæcum is always found packed with putrefying fæces. If a suitable aperient is added to the oat and milk diet, the guinea-pigs withstand the diet for long periods without developing scurvy. McCollum and Pitz further tested their theory by preparing an "artificial orange juice" in which every constituent was known, and found it to exert a decidedly protective action when added to the oat and milk diet. It is suggested, therefore, that scurvy may be proved to be a disease due to bacteria or their toxins invading the body from the cæcum. In the feeding of infants also there is reason to believe that milk pasteurized at 165° F. for thirty minutes is more liable to cause scurvy than milk pasteurized at 145° F., or boiled. Pasteurization at 145° F. permits the survival of lactic acid-forming bacteria; pasteurization at

165° F. permits the development of the putrefactive sporing bacteria in the interval between pasteurization and consumption. Further evidence goes to show that ageing of milk augments the danger of the development of scurvy in infants.

As regards pellagra, the incidence of this disease among the peasant population of Northern Italy, and the fact that the chief source of their protein is maize, has given rise to the current view that pellagra is due to the absence in the diet of tryptophane, since the chief protein of maize, zein, lacks this amino-acid. While all observers are agreed that the diet is of primary importance in the aetiology of the disease, there is abundant evidence that the eating of maize has nothing to do with its causation. Briefly put, it would appear that the diets of pellagrins are on occasion deficient in three respects. The diets are of low protein content and do not yield a mixture of amino-acids favourable for transformation into body tissues. They lack a sufficient amount of the unidentified dietary essential, fat-soluble A. They are deficient in certain mineral elements, chiefly calcium. Any one of these deficiencies is sufficient to induce malnutrition in the young or adult. Not everyone, however, on such a poor diet develops the disease, and cases of pellagra occur in people whose diet has been entirely adequate. Jobling [14] has pointed out in his survey of pellagra in Nashville, that nearly all cases have their onset in the spring and early summer, and the Thompson-McFadden Commission [15], which made a thorough investigation of conditions in Spartanburg City, S.C., where pellagra is a scourge, have arrived at the conclusion that the disease is in some way related to a bacteriological factor. It seems logical in light of all the data available, to conclude that poor nutrition predisposes to infection, and that there is an infectious agent involved in the production of the disease. There can be no reasonable doubt that the possibility that pellagra is a "deficiency" disease, in the sense in which Funk employed this term, is definitely answered in the negative by the experimental work of McCollum and his co-workers.

As regards rickets, everyone is agreed that this is a nutritional disease, but current opinion is sharply divided on account of the work of Noël Paton and his co-workers on the one hand, who have directed attention to certain concomitant environmental conditions, and on account of the work of Mellanby and his associates on the other hand, who have laid stress on the nutritional factor [16]. In this connexion it might be suggested that the placing for purposes of comparison of a bow-legged puppy opposite a knock-kneed child [17] shows a want of appreciation of clinical findings. The determination by McCollum and his co-workers of what constitutes an adequate diet makes it clear that rickets is not due to the absence of any so-called "vitamin." Errors in the child's diet or in the diet of the mother if the child is breast-fed, dependent on maladjustments and unsatisfactory quantitative relationships among the now well-recognized constituents of the normal diet, will result in malnutrition and presumably predispose to rickets. Deficiency in the diet of fat-soluble A has been found to result under experimental conditions in the development of xerophthalmia, and this disease occurs sporadically in man. So far as is known, the incidence of xerophthalmia and of rickets have no analogy. In view of McCollum's work in determining the requirements of an adequate diet, the nutritional condition can only be regarded as predisposing to the development of rickets, and accordingly a fresh impetus is given to the view as to an infective nature of the disease as suggested by its known dis-

tribution. The determination of what constitutes an adequate diet also provides a fresh field for the investigation of many of the conditions of malnutrition resulting in marasmus and death in infants. In the absence of information concerning the specific requirements of an adequate diet, and in view of the conclusions arrived at by investigators of the so-called "deficiency diseases," it was natural that the earlier views of epidemiologists, based as they were on an infectivity theory, should have been suspended, but the fundamental results obtained by McCollum do nothing but stimulate the earlier hypothesis.

It is in regard to the known infective processes that information concerning the influence of nutrition from the epidemiological standpoint is most desired, and in this connexion knowledge is much more uncertain. Thus, with reference to tuberculosis, inferences as to the nutritional element are abundant, but without confirmation. For instance, it is stated that "the incidence of tuberculosis in a community appears to be closely correlated with the food supply; the incidence of the disease diminishes when the food supply is ample and suitable, and increases when for one reason or another food is difficult to obtain, and the quantity and the quality of the diet become inadequate" [18]. So also McCollum states, without convincing argument, that "an examination of any large group of people in the cities will show that where there is a high mortality from tuberculosis, milk is not being used to any great extent, and in any large group where milk purchases are large the disease is not a menace."

Observations of such a description are invalid in the absence of accurate experimental data. McCollum has found, however, that lung infections very frequently end the lives of animals, death manifesting itself often only in the second generation, when diets are faulty in some degree, but not so faulty as to make their effects strikingly apparent.

By means of the biological method, the requirements of an adequate diet have been defined, and the method of indirect calorimetry provides means for the accurate investigation of nutritional needs that were not available in the past. Thus the nutritional requirements of soldiers in training have been determined [19], and it would now appear to be possible to determine accurately the nutritional value of every kind of food for each age and sex and occupation.

From the disease point of view, results of equal interest may be obtainable. Even with our strictly limited knowledge of immunological processes, it is clear that there is for each disease what, for want of a better terminology, may be described as a "proper" metabolism. The investigation of such conditions in the light of the new knowledge is urgently required.

Epidemics of disease will continue to recur according to the biological law that determines them. It is suggested that the amount of an epidemic may be dependent in part on nutritional conditions. In any case it is urged that the application of the new methods of nutrition to the investigation of disease problems is desirable.

REFERENCES.

- [1] BROWNLEE, *Proc. Roy. Soc. Med.*, 1909, ii (Epid. Sect.), p. 243. [2] HAY, "Saline Cathartics," *Journ. Anat. and Physiol.*, 1881, xvi, pp. 243, 391, 568. [3] BOWLEY, "Prices and Wages in the United Kingdom, 1914-20," p. 106. [4] FLÜGGE, *Zeitsch. f. Hyg.*, 1905, xlix, p. 363. [5] LEONARD HILL, "Science of Ventilation and Open-air Treatment," Medical Research Council's Report. [6] CATHCART, *Journ. Roy. Army Med. Corps*, 1918, xxxi, p. 339. [7] LEONARD HILL and CAMPBELL, *Brit. Med. Journ.*, 1921, i, p. 733. [8] ORR and KINLOCH, *Brit. Med. Journ.*, 1921, ii,

- p. 39. [9] WALLER and DE DECKER, *Brit. Med. Journ.*, 1921, ii, p. 627. [10] FUNK (1), *Lancet*, 1911, ii, p. 1266; (2) *Journ. Biolog. Chem.*, 1915, xxiii, p. 413. [11] MCCOLLUM, "The Newer Knowledge of Nutrition," The Macmillan Publishing Co., 1920. [12] MCCOLLUM and PITZ, *Journ. Biolog. Chem.*, 1917, xxxi, p. 229. [13] JACKSON and MOORE, *Journ. Infec. Dis.*, 1916, xix, p. 478. [14] JOBLING and PETERSON, *Journ. Infec. Dis.*, 1916, xviii, p. 501. [15] THOMPSON-MCFADDEN COMMISSION, *Journ. Amer. Med. Assoc.*, 1914, lxiii, p. 1090. [16] "Accessory Food Factors," Medical Research Committee Report, Series No. 38, 1919. [17] MELLANBY, "Experimental Rickets," Medical Research Council Report, Series No. 61, 1921, figs. 1 and 2. [18] HAMILL, "Diet in Relation to Normal Nutrition," Reports on Public Health and Medical Subjects, No. 9, 1921. [19] CATHCART and ORR, "The Energy Expenditure of the Infantry Recruit in Training," H.M. Stationery Office, 1919.

Section of Epidemiology and State Medicine.

President—Dr. A. K. CHALMERS.

Experiences with the Schick Test and Active Immunization against Diphtheria.

By S. MONCKTON COPEMAN, M.D., F.R.S.

(Ministry of Health.)

A SYSTEM of diphtheria prevention, based on the use of the Schick test, as a means of recognizing susceptibility to diphtheria, coupled with the method of conferring active immunity by inoculations of a standardized toxin-antitoxin mixture, has recently been adopted on an extensive scale in America, especially in New York and Boston, where prevalence of diphtheria has been greater, and the mortality from this disease considerably higher, than in this country.

It would be premature at present to advise that in English communities general immunization of persons susceptible to diphtheria should be attempted on the New York scale. More information and experience is necessary before this could be recommended. At the same time, there are already circumstances in which the evidence available may be considered to warrant full trial of the Schick reaction, and toxin-antitoxin immunization, particularly in the case of certain institutions, such as schools, in which the method appears capable of affording results of the utmost value and importance and especially perhaps in the case of nurses and other persons likely to come much into contact with diphtheria. And it is with an account of a specially detailed investigation of this preventive method in all its bearings, recently carried out at the schools belonging to the Guardians of one of the Metropolitan Unions, that the present communication is mainly concerned.

[*Description of Schick test and its results, illustrated by colour process lantern slides.*]

During prevalence of a severe outbreak of diphtheria which occurred at Bristol about a year ago, the Ministry received a communication from the Medical Superintendent of the Southmead Infirmary of the Bristol Union, reporting the sudden occurrence of an exceptionally virulent type of the disease in the children's ward of that institution, in circumstances which seemed to call for special investigation of the conditions under which the disease was spreading.

In course of a local inquiry which was consequently undertaken, occasion arose of utilizing the Schick reaction, and of immunizing certain of the susceptible children by toxin-antitoxin inoculations. There were, however, difficulties as to the preservation of the full activity of the standard toxin, when transmitted through the post in hot weather, and in arranging for the necessary technical and laboratory work.

Subsequently the medical officer of the Mitcham Poor Law Schools belonging to the Holborn Guardians intimated that in view of the prevalence of diphtheria, he was anxious to apply this test to the children in the schools,

and was also anxious to receive any technical advice and assistance which the Ministry could give.

The Mitcham schools contained a resident population of 329 children, ranging in ages from 3 to 16 years, all of whom until quite recently not only lived, but received their education, in one or other of the three adjoining institutions. The average weekly rate of admissions and discharges is so small that the population is a remarkably stable one. Before November, 1920, these schools had been practically free from infectious disease, for a period of about five years; but since then, they have suffered invasion from diphtheria, scarlet fever and tonsillitis, more or less continuously.

As regards diphtheria, notified as such, twenty cases occurred during the past year (1921), between March 24 and August 4. It is worth noting that considerable intervals of time elapsed during which the Institution was apparently free from the disease, more especially from April 14 to June 3 and again from June 20 to July 8, 1921. On the other hand, cases diagnosed as tonsillitis had occurred more or less continuously since September, 1920; in five of these the patients eventually proved to be carrying the diphtheria bacillus in their throats (two of them during the month of June, 1921, developing diphtheria in clinical form). It therefore became a point of interest to determine to what extent this was happening in other cases of tonsillitis, and also among the apparently healthy members of the community.

With this object in view all the children, as well as the teachers in the schools, were "swabbed" late in June, 1921, but as regarded their throats only. The "swabs" were examined by Dr. Cave, Superintendent of the Mitcham Infectious Diseases Hospital, who was able to demonstrate the presence of the Hoffmann bacillus in many cases, although he did not succeed in any instance in isolating the specific Klebs-Loeffler bacillus.

Subsequently at the suggestion of Dr. Fegen, the medical officer of health, "swabs" were also taken from the noses of all the children in the Infants' Department, from one of which, derived from F. A.—a boy aged 6, Dr. Cave isolated the Klebs-Loeffler bacillus in pure culture. As it seemed important to determine whether the organism was virulent, or not so, further "swabs" taken from this boy's nose and throat were forwarded to Dr. Eastwood at the Ministry's Pathological Laboratory, local facilities for carrying out the necessary work not being available. Cultures obtained from both of these "swabs" proved, however, in each instance, to be non-virulent on being submitted to the necessary tests.

Subsequently to July 21, 1921, when this boy was removed to the isolation block, in consequence of the positive result obtained *qua* presence of the diphtheria bacillus in the nose, two cases of diphtheria broke out (both in the Infants' Department) which were notified on July 22 and on August 4 respectively. From August 4 onwards, to the present time, no further case of the disease has occurred in these schools—in regard to which I desire to place on record our appreciation of the valuable assistance afforded by Dr. Morrish, the Medical Officer; Mr. Drury, the Superintendent; Mrs. Drury, the Matron, and the resident Sister and Nurses of the Schools' Infirmary, in arranging the practical details of the work.

The plan of investigation initiated at this point was briefly as follows:—

Commencing with the Infants' Department, lists of the children giving name, age, and date of diphtheria attack (if any) were made out. Taken in their order on these lists, batches of children, the number of which increased daily as the work progressed, were "swabbed" as to both nose and throat

by Dr. Eagleton, and subsequently they underwent the Schick test at the hands of Dr. O'Brien. The actual Schick test was invariably carried out on the left forearm, while a control test with toxin which had previously been heated to 75° C. was carried out at the same time on the right forearm. In a few instances, both test and control had to be carried out on the same arm owing to the presence of sores, or gnaw-bites on one forearm. No special difficulty, however, in subsequently reading the results was encountered as the outcome of this procedure.

As a general rule all the children who had undergone the Schick test were examined daily for the first week, and at irregular intervals afterwards up to as much as a month from the date of performance of the test. In most instances, thanks to the fact of a control injection having been made in each case, little difficulty was experienced in correctly interpreting the result, each "reading" confirming those that had been made previously. On the other hand, in a few instances, it was found not only difficult, but also impossible, to be certain as to the correct interpretation, while very occasionally, the opinion, based on an early reading, had to be modified at a later stage. This was a confirmation of earlier experience derived from work carried out on similar lines at Bristol, that it is inadvisable to express a definite opinion as to the ultimate interpretation of the result following on performance of the Schick test until after the lapse of a period of at least ninety-six hours.

Occasionally it was found desirable to repeat the test owing to difficulty in determining the correct reading of the result in the first instance. In these cases, as in others of more definite character, confirmation was sought by direct estimation of the antitoxin content of the blood, the small quantity necessary for this purpose being withdrawn from a vein at the elbow.

Result of Schick Test at Mitcham Schools.—Of the total population of 329 children all have been submitted to the Schick test. Including "combined" reactions under the heading of "positive" and "pseudo-" reactions under the "negative" section, 102, or rather less than one-third of the total were proved to be non-immune, i.e., susceptible to attack by diphtheria. These have now all been immunized by means of at least three separate inoculations of T.A. at intervals of about one week. The technical work of the investigation was carried out by Dr. O'Brien and his colleagues, who will present for discussion the details of the work, which, in respect of the care, skill and thoroughness devoted to its accomplishment, constitutes an advance on any investigation on the subject previously recorded in this country at any rate.

(*Postscript.*—This technical work is published in full in the *Journal of Experimental Pathology* for February, 1922.)

Schick Test: Bacteriological Examination of 300 School Children.

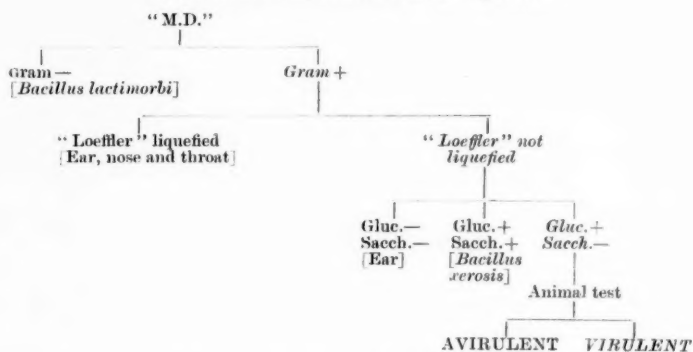
By A. J. EAGLETON, M.D., C. C. OKELL, M.B., and
E. M. BAXTER, M.Sc.

(ABSTRACT.)

DURING the wane of a diphtheria epidemic in an institutional school at Mitcham nose and throat swabs were taken by Dr. C. C. Okell and Dr. Eagleton from all the inmates: 329 children were so examined (Series I) and the process

was repeated eight weeks later on 327 of these children (Series II). Series I showed a carrier rate of 5.47 per cent., Series II a rate of 1.8 per cent.—the diagnosis of the diphtheria bacillus being made on morphological grounds only. In Series I virulent diphtheria bacilli were isolated five times and avirulent three times. In Series II no virulent bacilli were isolated, but avirulent diphtheria bacilli four times. Comparing the results with those obtained in a series of diphtheria convalescents, and bearing in mind the pitfalls met with in routine morphological diagnosis of diphtheria bacilli, Dr. Eagleton felt that a knowledge of the percentage of contacts from whom virulent diphtheria bacilli could be isolated was of more value than the finding of the "carrier rate" by a method of diagnosis depending solely on morphology. His conclusions were: (1) that in the case of swabs from suspected cases of diphtheria a morphological diagnosis was sufficient; (2) the same was true of swabs from convalescents suspected of being persistent carriers; (3) that in the examination of swabs from "contacts" or normal population the diagnosis should not be made on morphological grounds alone, but the true diphtheria would have to conform to the tests in the following table:—

DIFFERENTIAL DIAGNOSIS OF *Bacillus diphtheria*.



"M.D." = a bacillus morphologically diphtheria.
 Gluc. = glucose. Sacch. = saccharose.

Laboratory Control of the Schick Test and Active Immunization.

By A. T. GLENNY, B.Sc., and K. ALLEN.

(ABSTRACT.)

Mr. GLENNY said that the standard adopted by Schick of $\frac{1}{50}$ M.L.D. of toxin as a test dose for the Schick test was not ideal. The test was quantitative, depending upon neutralization of toxin by antitoxin. Antitoxin also neutralizes toxoid, and as toxoid was present in varying proportions in different batches of toxin, a standard depending upon toxin content alone might give different results with different toxins. It was possible to produce a toxin of which $\frac{1}{50}$ M.L.D., as the Schick test dose, would condemn as susceptible

individuals with as much as $\frac{1}{100}$ unit of antitoxin per cubic centimetre of blood, while another toxin would pass as immune those possessing only $\frac{1}{1000}$ unit. Until a more satisfactory standard involving neutralization of antitoxin was adopted, it would be necessary carefully to choose the toxin to be used for the test. Toxin in high dilution was very labile, and each preparation must be controlled by animal tests. Two methods were in use: (1) the determination of the minimal reacting dose; (2) the titration against antitoxin. Both methods involved intracutaneous injection into guinea-pigs. The second of these methods would form a satisfactory standard for the dose to be adopted for different toxins. Doubtful Schick reactions could be controlled by determining the antitoxin content of the blood of the individual under test. For such determination the usual intradermic method of testing was used, with slight modification necessary in dealing with small quantities of blood and low antitoxin content. The preparation of toxin-antitoxin mixtures for active immunization needed careful control. The mixtures must be shown to be non-toxic for guinea-pigs in doses of 1 c.c., according to the recommendation of American authorities. In addition to these, however, the immunizing properties should be tested on guinea-pigs and rabbits. When such methods of testing antigenic values were established, the immunizing values of the mixtures might be increased by selection of toxin used.

Schick Test and the Subsequent Active Immunization.

By R. A. O'BRIEN, M.D.

(ABSTRACT.)

OF 300 children 31 per cent. gave a positive result when tested by the Schick method. This figure closely resembled that found by Park and Zingher in New York. Repeated tests on the same subjects gave the same results. Of readings made on the first day 95 per cent. agreed with the final readings of the fourth day. When readings were recorded as "doubtful," it was probable that nearly all such cases were really immune, assuming that the toxin dilution used had been full of potency and the injection technique correct. Eighteen children who had had diphtheria some weeks earlier were tested: three gave a positive Schick response, two a negative, and thirteen a negative (and pseudo-) reaction. Five carriers of virulent bacilli were tested, and all gave a negative reaction. It was probable that all true carriers of virulent bacilli gave a negative Schick response; if positive, they were incubating the disease, and would suffer an attack in the immediate future. Avirulent carriers might give a positive or negative reaction; of seven tested one gave a positive Schick reaction, and six a negative. All children giving a Schick positive reaction were immunized with toxin-antitoxin mixture. Ninety-nine were tested eleven weeks later; two only gave a positive response, the remainder were immune. These two had been reinoculated, and now gave a negative Schick reaction. Practically no general reactions occurred; local reactions were common, but caused very little interference with the children's activities.

DISCUSSION.

Sir G. BUCHANAN (in a communication read in his absence by the Hon. Secretary) said that in a recently published note on diphtheria prevention he had laid stress on the importance first, of overhauling, modifying and improving preventive methods which

were based on the segregation of diphtheria cases and different kinds of "carriers"; and, secondly, in appropriate instances, of adopting the entirely different system of dealing with individual susceptibility which was so extensively employed in New York, Chicago and other American cities. Residential child communities, of all social grades, were very suitable localities for the adoption of the second method in this country, first, because of the serious results in health, dislocation of work, and cost, which frequently followed the outbreak and spread of diphtheria in public schools, orphanages and cottage homes; and, secondly, because it was at such establishments especially that the most favourable circumstances for the application of the Schick test and active immunization under the best conditions for observation, judgment of reactions, and necessary records, were most likely to occur. It would be unwise to take the American or any other experience merely at its face value, but it would be equally wrong to disregard a large body of well-supported facts which indicated that by a simple and practically harmless procedure, readily assented to when properly explained to responsible parents or guardians, a school or institution of this kind could be kept permanently free from diphtheria, and the diphtheria carrier, in the event of arrival, could be disregarded. Dr. Copeman and Dr. O'Brien had shown how the method had been applied at an institution in which the authorities felt it incumbent on them to make use of new knowledge to protect the children under their care. At this institution 100 per cent. of natural or induced immunity, in the sense of the Schick test, had been secured. If, as he (Sir G. Buchanan) hoped, the system was maintained with new arrivals, and records were kept, they would, in course of time, obtain a valuable piece of independent evidence in their own country of the degree and duration of the protection acquired. They had already good reason to expect that such protection would be high and would last substantially over many years. There would therefore seem to be justification in promoting the adoption of the method in any other similar institution in which it could be undertaken with necessary thoroughness and skill. The question whether the method should or should not be recommended by public health authorities in such institutions was so important at the present time that he hoped that if any objections, theoretical or practical, could be made, they would be brought out in the discussion and fully considered. As a practical point it was desirable to consider whether the system could successfully be started in an institution not itself affected by diphtheria and at a time when diphtheria was relatively little in evidence. Theoretically, perhaps this would be the best time to begin, but, in practice, the difficulties of obtaining consent in the absence of apprehension of the disease might be considerable, no matter whether one was dealing with a public body or with individual parents. He hoped the attention of the Section would also be given to two other matters which seemed relevant in that connexion. First, had they not reached a stage at which the medical officer of every isolation hospital should ascertain the Schick reaction of every member of the staff, and offer immunization to all positive reactors? And, secondly, should not the Schick reaction be demonstrated to all students in their infectious diseases course? Or perhaps still better, demonstrated in the ordinary medical course of every medical school, where there would be no lack of volunteers?

Dr. TOPLEY referred to the instances of positive Schick reactions in patients recently recovered from an attack of diphtheria during which they had received injections of antitoxic sera. These instances seemed to suggest that the temporary passive immunity conferred in this way prevented, in some cases at least, the acquirement of the more permanent active immunity, which was usually considered to follow an attack of this disease. In view of the considerable interest of this question, in connexion with the general problems of immunity, were there any statistical data indicating that second attacks of diphtheria were more common now than in the days before antitoxin came into general use, or that patients who received large doses of antitoxin early in the disease were more liable to suffer from a second attack than those patients who received antitoxin at a later stage and in smaller doses? With reference to the rarity of the combined positive and pseudo-reaction, might not this imply that the two reactions were not really independent, but that the hypersensitiveness evidenced by the pseudo-reaction—perhaps to the bacterial protein—was commonly associated with an immunity to the

exotoxin? Which of the two following was to be regarded as the more reliable means of differentiating a negative pseudo-reaction from a positive combined reaction: (1) differences in the size and intensity of the skin reactions; or (2) differences in their rate of fading?

Dr. A. K. CHALMERS (President) submitted the following observations by Dr. ARCHIBALD, Superintendent, Belvidere Fever Hospital, Glasgow, who had made some use of the test in the fall of last year:—

SCHICK TEST.

The following is a note of the results obtained by the test during October, November and December, 1921. The toxin used was, for the most part, supplied from the Wellcome Research Laboratories, and the outfit consisted of: (1) A capillary tube of undiluted toxin; (2) 10 c.c. of phenol saline to dilute the toxin; (3) 10 c.c. of phenol saline plus heated toxin for control test. The site selected was the flexor aspect of the forearm, and in every case injection and control were made on the same arm for better comparison. Care was taken that the injection was made intradermally. The dose employed was a fiftieth of the minimum lethal dose for a 250-grm. guinea-pig in 0.2 c.c. of normal saline. Each case was inspected daily for a week and the result usually determined ninety-six hours after injection.

Types of Subjects.

(a) *Nurses not exposed to Diphtheria.*—None of these nurses gave a history of having suffered from diphtheria.

Injections	Result
19 	3 positive

In this group the three positives received two doses of 1 c.c. toxin-antitoxin intramuscularly, a week elapsing between the doses. No constitutional reaction was recorded, but a local reaction—redness, swelling and induration—occurred in each case. This local reaction was not severe and did not render any of the nurses unfit for duty. Two doses only were given because in no case was the reaction, even when positive, accompanied by any constitutional or even local disturbance, and it was assumed that two instead of three would be sufficient.

(b) *Scarlet Fever Cases exposed to Diphtheria:*—

Injections	Result
19 	6 positive
3 pseudo-reactions	

Among the ten subjects with negative reactions there were: (1) A female, aged 15, who had suffered from diphtheria at 5 years of age; her throat yielded definite repeated positive swabs; (2) a female, aged 6, who also yielded definite repeated positive swabs. Unfortunately, these swabs were not submitted to virulence tests. Among the six positive Schick tests two only had positive findings from the throat, but one case, aged 10 years, with a negative throat finding, showed a vesicular local reaction with the Schick toxin. This subject exhibited a constitutional reaction to toxin-antitoxin inoculation. The three patients who had pseudo-reactions all yielded negative throat swabs. In this group of cases immediately exposure took place the Schick test was performed. Serum was not given to positive cases until twenty-four hours later, when the results of throat cultures were known. The giving of serum may possibly have rendered equivocal the Schick test negative findings in two cases. It is interesting to note that, in connexion with this group of cases, three nurses (two of whom had not nursed diphtheria and one who had) had the Schick test applied. The latter yielded a positive Schick and a negative swab from the throat. Three days later she developed diphtheria before toxin-antitoxin injection was undertaken. In another group of tests carried out in the same class of cases, namely, scarlet fever cases exposed to diphtheria, twenty injections yielded nine positive results. All had negative throat findings at time of test. In yet another group twenty injections yielded eight positive results and one pseudo-reaction. All these patients at the time of the test had negative throat

cultures. Of the eight positive, three developed clinical diphtheria within three days, and one case, which had a negative Schick reaction, developed clinical diphtheria with positive throat cultures on the fourth day after the test. No prophylactic dose of toxin-antitoxin had been given. In a further group of six cases no positive Schick tests were obtained. All the six had negative throat findings at time of test, but two developed positive throat swabs two days after the test. Summarizing these cases of scarlet fever exposed to diphtheria: sixty-five injections yielded twenty-three positive reactions. No difference was noted either in the scarlatinal pyrexia as the result of the Schick test, or in the stages of the Schick test as the result of the pyrexia.

(c) *Scarlet Fever Cases not exposed to Diphtheria :—*

Injections	Result
55 	9 positive

There was no previous history of diphtheria in any of these subjects.

(d) *Enteritis Cases exposed to Diphtheria :—*

Injections	Result
8 	2 positive

All these subjects yielded negative swabs from the throat.

(e) *Enteritis Cases not exposed to Diphtheria :—*

Injections	Result
8 	No positives

(f) *Cases of mixed Scarlet Fever and Diphtheria Infections after Serum Treatment :—*

Injections	Result
7 	No positives

(g) *Doubtful Diphtheria Cases before Serum was given :—*One case notified diphtheria (?) gave a negative Schick. Swabs subsequently from the throat were negative.

(h) *Measles Cases exposed to Diphtheria :—*

Injections	Result
14 	3 positive

(i) *Measles Cases not exposed to Diphtheria :—*

Injections	Result
12 	2 positive

Summary.

Total number of tests, 181.

Total number of positive findings, 42 (or 23·3 per cent.).

Total number of tests in patients not exposed to diphtheria, 94.

Total number of positive findings in patients not exposed to diphtheria, 14 (or 14·9 per cent.).

Age Incidence.—Of the total cases—

13·8 per cent. were over	...	...	...	15 years
31·5 per cent. were between	...	...	...	5 and 15 years
54·7 per cent. were under	...	...	...	5 years

Of the unexposed cases—

22·3 per cent. were over	...	...	...	15 years
24·4 per cent. were between	...	...	...	5 and 15 years
53·2 per cent. were under	...	...	...	5 years

Section of Epidemiology and State Medicine.

President—Dr. A. K. CHALMERS.

The Relationship between Puerperal Septicæmia and other Infectious Diseases, with Reference to the Admission of Maternity Cases into Isolation Hospitals.

By EVELYN D. BROWN, M.B.

(ABSTRACT.)

FOR many years there has been a controversy with regard to the possible relationship between the puerperal state and liability to infection with scarlet fever, and discussion has centred in the clinical aspect of the cases. But to-day, when municipal authorities are considering the provision of accommodation for maternity cases, the question becomes one of hospital administration.

Obstetricians of fifty years ago—amongst whom may be mentioned: Braxton Hicks [2], Spencer-Wells [7], Galabin, and Matthews Duncan—held varying opinions as to the relationship, or otherwise, of these diseases, and in the *Transactions of the Obstetrical Society of London*, 1875-80, are recorded discussions that took place on this subject. At that time scarlet fever differed in age of attack, in clinical appearances, and in virulence from the disease as we know it now.

The history of scarlet fever as a definitely recognizable disease dates from Sydenham's description in 1675 [3], and records remarkable rises and falls in its virulence. In 1732 it was "a fever of a milder kind than the measles, and does not want the assistance of a doctor"; four years later it "was very malignant, raged with great fury, and swept away many in twenty-four hours." To-day it is again less fatal than measles, and of practically universal incidence. Seventy years ago scarlet fever was a disease of adults accompanied by much general disturbance, with death as a common termination—a type of disease easily confused with acute septicæmia.

The history of puerperal fever dates from the days of Hippocrates; nothing in it points to variation in frequency of incidence or in clinical manifestations.

The term "puerperal mortality" is used to express the number of deaths from puerperal septic diseases per thousand births.

From statistics published in the Annual Report of the Registrar-General,

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a table has been drawn up correlating the mortality-rates of puerperal fever and scarlet fever for England and Wales, 1868-1917; and for County Boroughs and Administrative Counties during single years.

Puerperal mortality and scarlet fever mortality, England and Wales, 1868-1917	$r = 0.004 \pm 0.09$
Puerperal mortality and scarlet fever mortality, Administrative Counties, 1912	$r = 0.06 \pm 0.07$
Puerperal notifications and scarlet fever notifications, London Boroughs, 1915	$r = 0.06 \pm 0.11$

These figures suggest that there is no association between the rise and fall of the two diseases over a period of years, or in particular areas during any individual year.

In relation to other infectious diseases the figures are:—

Puerperal mortality (1868-1917) and death-rate from measles ...	$r = 0.14 \pm 0.09$
" " " " " diphtheria	$r = 0.009 \pm 0.10$
" " " " " influenza	$r = 0.014 \pm 0.10$

During the period under survey the birth-rate has fallen steadily—the puerperal mortality rate has not altered to the same extent. What factors operate to maintain so steady a puerperal mortality rate? From the records of midwives with extensive practices in districts of varying social aspects the following information is found:—

Correlation coefficient between age-group and abnormality ...	$- 0.13 \pm 0.02$
" " " " order of pregnancy...	$+ 0.71 \pm 0.01$
" " " " order of pregnancy and abnormality	$+ 0.09 \pm 0.02$

This suggests a tendency for the occurrence of abnormality in the early age groups. The mean age at marriage has increased; more births fall into the later age groups, so that the increased age of the primipara cannot be maintaining the puerperal mortality rate.

The ratio of deaths from accidents of pregnancy has decreased during the last fifty years.

The number of domestic indoor servants per 1,000 households is taken as a measure of social comfort; from a study of the London areas there is nothing to suggest that the woman in good economic circumstances is more or less liable to septic infection than the "working" woman. It is obvious, therefore, that we must look not to internal but to external influences for an explanation of the maintenance of the puerperal mortality-rate. Regarding puerperal mortality as an introduced, i.e., as a surgical infection, we must look for a source of infection and a means of spread of the same:—

Puerperal mortality-rate ...	= Measure of a specific infection
Proportion of medical practitioners and midwives per 1,000 population ...	= Measure of suspected carriers of infection
Proportion of domestic servants per 1,000 households ...	= Measure of general environmental condition
Notification-rate of erysipelas ...	= Measure of prevalence of "dirt diseases"

There is a small positive coefficient (0.14 ± 0.07) for the notification rate of puerperal fever and erysipelas, with birth-rate constant (County Boroughs, 1911).

When considering the parts played by the suspected agents—medical practitioners and midwives—the value of any conclusion is seriously diminished by the difficulty of obtaining information as to attendances at births. There is little to distinguish between the numbers attended by doctors alone, midwives alone, doctor with midwife, or doctor with handywoman.

Puerperal mortality and percentage of births attended by midwives (Carnegie Report, 1917)	$r = 0.05 \pm 0.07$
Puerperal mortality and proportion of births notified by midwives (County Boroughs, 1919)	$r = 0.02 \pm 0.06$
Puerperal mortality and rate of midwives per 1,000 births (County Boroughs, 1911)	$r = 0.12 \pm 0.07$
Puerperal mortality and proportion of medical practitioners with proportion of domestics constant (County Boroughs, 1919)	$r = 0.347 \pm 0.07$
Puerperal mortality and proportion of medical practitioners with erysipelas rate (County Boroughs, 1919)	$r = 0.15 \pm 0.07$
Puerperal mortality and proportion of medical practitioners with erysipelas and proportion of domestics (County Boroughs, 1919)	$r = 0.40 \pm 0.06$

Prima facie this suggests that the practitioner is the carrier of sepsis to the parturient woman; but the conclusion to be drawn is that the danger lies in the number of attendants at the confinement.

Puerperal sepsis is to be regarded as a "dirt disease." Its prevalence is determined by the presence of micro-organisms, not of scarlet fever, diphtheria, and measles, but of erysipelas and any acute inflammatory skin lesion. An inquiry was made with the object of discovering the amount of infection occurring in municipal isolation hospitals admitting maternity cases.

Information was obtained from three institutions adopting varying degrees of staff isolation, and the numbers of rises of temperature, above 100° F., on a morning and evening chart for the fourteen days of the puerperium, were compared. The figures are as follows:—

	Number of rises of temperature per 100 patients (28 observations per patient)
(a) Institution adopting complete isolation building and staff ...	14.618
(b) " " separate buildings and partial isolation of staff ...	14.534
(c) " " " " " practically no isolation of staff ...	14.286

The material is comparable, and the amount of infection in the three types of building is singularly constant.

I believe that with efficient administration the policy of admitting maternity cases into isolation hospitals is sound and practical.

REFERENCES.

- [1] BOXALL, R., "Scarlatina during Pregnancy and in the Puerperal State," *Trans. Obst. Soc. Lond.*, 1888, xxx, pp. 11-71. [2] BRAXTON HICKS, "A Contribution to our Knowledge of Puerperal Diseases," *Trans. Obst. Soc. Lond.*, 1875, xvii, p. 101. [3] CREIGHTON, "A History of Epidemics in Great Britain," 1894, vol. ii. [4] EWART, R. J., "Epidemiology of Scarlet Fever," *Journ. Hyg.*, January, 1916, p. 209. [5] GEDDES, "Statistics of Puerperal Fever," 1912. [6] LEA, A. W. W., "Puerperal Infection," 1910. [7] SPENCER-WELLS, "On the Relation of Puerperal Fever to the Infective Diseases and Pyæmia," *Trans. Obst. Soc. Lond.*, 1875, xvii, pp. 90, 265.

DISCUSSION.

Dr. DUDFIELD said he thought that an average percentage of over 10 per cent. of febrile conditions in the puerperium was not altogether satisfactory. His experience of work at the Rotunda—over thirty years ago—was that a normal confinement should not be followed by any elevation of temperature. The Master at the Rotunda in those days would have been much perturbed if even 1 per cent. of his patients had anything but a “straight-line” chart. Dr. Brown apparently attributed the occurrence of puerperal sepsis to the medical attendant—a conclusion which was reached by Geddes in his “Statistics of Puerperal Fever.” Dr. Dudfield was not convinced of the validity of Dr. Geddes’ arguments, nor did he think that any conclusion could be arrived at except by inquiries based on actual cases. His own inquiries certainly did not support the view put forward by Dr. Brown. It should be remembered that the majority of septic cases occurred in abnormal confinements, cases in which midwives were obliged to call in medical practitioners. That meant that the medical man took up the cases after labour had gone on for some time, and during that period frequent vaginal examinations had in all probability been made by the midwife—or even by the handy-woman!

Dr. R. J. EWART referred to his experience as Superintendent of the Municipal Hospital, Barking, which admitted all forms of sickness, and to the outlying precautions taken in the administration. The routine was much the same as was carried out in a surgical ward. A separate section of the administrative block was set aside for those engaged in maternity work, and no restriction was placed on the intercourse between those engaged in the various classes of work, and no system of quarantine was insisted upon. The staff was changed from one department to another. He took a slight rise of temperature as a measure of possible infection and found no statistical difference between his experience and that obtained elsewhere. Out of about 400 cases one death from puerperal septicæmia occurred; this, however, was an instrumental delivery, and there was strong evidence to believe that the infection was brought from outside the institution. He felt justified, therefore, in advising his authority to continue this administrative experiment.

Dr. HAMER said that the teaching of the paper reminded him of the doctrine expounded by Dr. J. Matthews Duncan years ago. All the same the Section would not forget Dr. Longstaff’s “scarlatinal group of diseases.” Erysipelas, puerperal fever, scarlet fever and the other members of the group *did* show noteworthy correspondences as regarded seasonal prevalence, and, in less degree, in respect of the multiannual or major waves of disease. There must, therefore, he thought, be some as yet imperfectly understood relationship between the diseases of the scarlatinal group.

Dr. ELIZABETH MACRORY asked upon how many cases Dr. Brown had based the statistics of rise of temperature at the three hospitals mentioned. She (Dr. Macrory) was glad reference had been made to the relative amount of puerperal fever in the practices of medical practitioners and midwives as it gave opportunity of emphasizing the need of careful disinfection after contact with infection. Though quite mild cases of sapremia were frequently notified in the practice of midwives, their percentage of puerperal fever cases in London was much the smaller. Might not this be partly due to the very complete disinfection they did after attendance on any case of high temperature unless it was definitely diagnosed as not infectious? Dr. Macrory mentioned having been present at an inquest on a case of puerperal septicæmia in which a medical practitioner was concerned. Evidence was given of his having had two other fatal cases of puerperal fever within a very short period of time. He himself stated that he had disinfected his rubber gloves in the time intervening between the two cases, but that no disinfection of his obstetrical bag nor of its contents other than the gloves, nor of his clothes had been done. It was probable that nothing would have been known publicly of the carriage of infection among these women if death had not resulted, and therefore one wondered in how many less virulent cases, infection might have been similarly conveyed.

Dr. REMINGTON HOBBS said that confinements taking place in a maternity department, in which every modern device, in the way of sterilization, and every antiseptic precaution was taken, should practically exclude any suggestion of organisms being conveyed or introduced into the genital passages; and yet that in spite of all this, cases of puerperal sepsis occurred. He was of opinion that the organisms were already there. A rise in temperature could be caused by the absorption into the body of the toxins of certain bacteria, notably the pyogenic micro-organisms; and such absorption would occur when the bacterial toxins which were being formed were prevented from escaping. There was no mystery about the disease, which was a simple and straightforward surgical problem, and there was no need to look for extraneous causes.

Dr. A. K. CHALMERS (President) said that the precise reason for the inclusion of the term "puerperal fever" for the purposes of the Infectious Disease (Notification) Act had never been clear. Save on the ground that it was regarded as preventable, the disease had no special association with unhealthy districts, so far as he had been able to discover, and could not be said to have undergone any diminution within recent years. He took, for example, its ratio to births for the last thirty years in Glasgow, and found that instead of rates averaging just over 3 per 1,000 in the years 1891-95, since 1911 they were never lower than 5 per 1,000 and in 1920 the rate was 9. Before this could be regarded as representing a definite increase, however, the case mortality rate had to be considered, for while it had been 64 per cent. among the notified cases in the early nineties, it averaged 31 in the years 1916-20: and among those admitted to hospital it had fallen from 49 per cent. in the period 1901-6 to 28 in 1916-20 and was 20 in 1921. The increase in the ratio of notifications, therefore, might partly be the result of including within the term larger numbers of puerperal cases with some short-lived rise in temperature, although among the admissions to hospital there were more cases of the type which could be definitely regarded as sapremia. It was possible that on one point their experience in Scotland differed (before, at least the passing of the Midwives Act, which became law much later with them than in England), and that was in the relatively greater prevalence of the disease among midwives' cases. Quoting the figures for the year 1913, he found that of slightly over 15,000 births attended by medical practitioners, the rate was fully 3 per 1,000 births, while among rather less than 15,000 births attended by midwives, the rate was fully $6\frac{1}{2}$ per 1,000. There was, he thought, some importance, from the point of view of origin, in the rapidity with which the symptoms developed after labour, and he found it noted that in one group of 81 cases medically attended 76 per cent., and in another group of 68 attended by midwives, 62 per cent., developed symptoms not later than the fifth day. Closely associated with this aspect of the question were the local conditions grouped under the name puerperal fever, and he had before him a statement regarding 59 per cent. of 319 cases notified in Glasgow during 1921, of whom 24 per cent. (78) had died. In 41 per cent. details had not been obtained, but of the remaining 189 there was a local lesion or diseased condition in two-thirds, 53 began in abortion and 7 in placenta prævia. Of the total, 125, with 33 deaths, occurred in first pregnancies; 63, with 15 deaths, in second; 34, with 7 deaths, in third pregnancies; 22, with 1 death, in fourth pregnancies; and 75, with 22 deaths, in fifth or later. Forceps were applied on 69 occasions, of which 49 were in first pregnancies and 11 in second. Of 53 cases beginning in abortion, 24 were fifth or subsequent pregnancies. Even with the small numbers, the proportion associated with instrumental aid in first pregnancies and with abortion in fifth or later arrested attention. He hoped the discussion would have the effect of redirecting attention to the lesions which formed the starting point of the infections grouped under the term puerperal fever.

Dr. EVELYN BROWN, in reply to Dr. Dudfield, explained that the figures relating to rise of temperature of patients in municipal maternity hospitals of varying types were intended to be used as a measure of the amount of infection rather than of the number of patients infected. Each single rise of temperature above 100° F. (in the puerperium)

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was counted as a unit—and the figure (14 per cent.) referred to “fourteen units of infection” per 100 patients. The number of cases considered was given. In reply to Dr. Hobbs, Dr. Brown said she appreciated the question of the influence of autogenous infection, but considered that introduced sepsis was a more potent factor in the production of febrile conditions. The figures given by the President pointed to a higher incidence of sepsis among midwives’ cases: and were based on records containing exact information as to attendance at birth. The subject demanded further research; the present paper was but the beginning of an investigation.

Section of Epidemiology and State Medicine.

President—Dr. A. K. CHALMERS.

The Epidemiology of Summer Diarrhoea.

By JOHN BROWNLEE, M.D., D.Sc., and MATTHEW YOUNG, M.D.

(National Institute for Medical Research.)

THE epidemiology of summer diarrhoea, a disease hitherto generally described as a definite clinical entity, has been the subject of frequent and prolonged discussion. Many valuable papers, including those of Ballard, Niven, Peters, and Dudfield, have been devoted to its elucidation. There are still, however, some points which have either not been considered or merit further consideration, and these and their bearing on the conclusions deduced by others form the subject of the present paper.

The data on which the communication is based are chiefly the weekly mortality returns from diarrhoea in London as published by the Registrar-General for the period of years 1856-1921. For the years 1856-1910 the figures are for deaths at all ages, and for the period 1911-21 for deaths from diarrhoea and enteritis under 2 years of age, but as the latter comprise, on the average, 87 per cent. of the deaths at all ages, the comparison of the distribution in the two periods is not rendered invalid. The weekly numbers of deaths for several other English cities—namely, Manchester, Liverpool, and Birmingham, and some foreign cities—Paris, Berlin, Moscow, New York, and Chicago—for varying periods of years have also been examined and analysed, however, in the search for confirmation or refutation of the inferences drawn from the figures for London.

It has long been well known that warm summers are generally associated with excessive prevalence of diarrhoea. In 1887 Dr. Ballard [1] made a special report to the Local Government Board on this subject. In this he discussed the association of diarrhoea with air temperature and with earth temperatures at depths of 1 ft. and 4 ft., expressing the view that the prevalence of summer diarrhoea in epidemic form was most closely correlated with the movement of the temperature at the depth of 4 ft., and that the ascent of the curve of the epidemic began when the earth thermometer recorded a temperature of about 56° F., irrespective of the height of air temperature previously registered. Further, he stated that the amount of diarrhoea generally attained its maximum when the 4 ft. earth thermometer attained its mean weekly maximum. Since that time there has been by no means unanimity of opinion as to the temperature which has the closest association with the prevalence of diarrhoea. The opinion has been gradually becoming more general that, while Ballard's conclusion is broadly true, the ground temperature has not the specially close association with epidemic prevalence that was formerly believed to exist. How the air temperature acts, whether directly or indirectly through heating the earth, does not immediately concern us; what is important is, that the air temperature, which is most easily obtainable, is a good guide. The first important paper following Dr. Ballard's is that of Dr. Peters (1908) [8], who developed the idea that it was the excess temperature that had most effect. This, of course, is but expressing in a different way the opinion of Ballard, because the 4-ft. earth

temperature is an index of the accumulation. In 1912 Dr. Dudfield [4] returned to the subject. He found for Paddington that the correlation between the earth temperature and the air temperature and the number of cases attacked with diarrhoea were respectively 0.68 and 0.55, not a significant difference. In the discussion on this paper Dr. Stevenson [11] stated that for the twenty-three-years' period 1887-1909 he found the correlations between infantile deaths from diarrhoea and the records of the two temperatures to be 0.78 and 0.77 in the respective cases. Other associations with temperature were also given by Dr. Peters, for instance, that an epidemic of summer diarrhoea might be checked by a fall of temperature, to rise again when the temperature rose. Of these there are one or two examples in the history of epidemics in London, but, as will be seen later, they are capable of a different interpretation. Also, he has indicated that where the temperature is lower than, or fluctuating below, a critical temperature, namely, 60° F., the interval before the epidemic rises is extended.

It was at this point that our calculations were begun. As accumulated air temperature has been shown to be closely associated with the epidemic prevalence of the disease, an effort was made to determine if higher correlations could not be obtained by some other methods. As the deaths from summer diarrhoea could not be considered as of quite homogeneous nature, an attempt was made to eliminate the cases of doubtful origin by choosing various base levels. The deaths in no week were included in the calculations unless they reached at least 75. The next levels were 100, 125, and 150 per week respectively. The mean weekly temperature was treated in the same way. The standards of measurement were degrees of temperature in excess of 56° F., 58° F., 60° F., and 62° F. The numbers of deaths in the several years in excess of 75 per week, 100 per week, 125 per week, and 150 per week were respectively correlated with the excess of temperature over 56° F., over 58° F., over 60° F., and over 62° F., and the highest correlation was found between the deaths in excess of 100 per week, and the accumulated temperature over 60° F. This would appear to indicate that it is the excess of temperature over 60° F. that is most closely in relation to the epidemic prevalence of the disease, and that 100 per week is the number of deaths that is to be regarded as derived from cases not influenced to the same degree by the accumulated temperature over 60° F. Some further subdivisions were now made. The excess of diarrhoea deaths over 100 per week from the twentieth to the forty-seventh week of the year and the temperature in excess of 60° F. were correlated for the period 1856-1899, and the value found was 0.80. For the short period of years 1898-1911, excluding 1902, 1903, 1907, and 1909, for a reason which will presently be shown—years in which the epidemic was definitely later, the correlation was 0.75. Turning now to the excluded years and those following 1911—years in all of which the epidemic was much later—it is found that the correlation between temperature and deaths is here zero. This may appear a remarkable result. However, the same phenomenon is observed in the case of scarlet fever and enteric fever, both autumnal diseases. In London for the years 1871-1900 the correlation between the accumulated temperature and mortality from enteric fever is only 0.23, while that between temperature and the cases of scarlet fever notified in the period of years 1891-1920 is zero.

To determine more accurately the relation of the temperature to the rise of the epidemic, the excess of deaths over 100 per week up to the end of the twenty-ninth week was correlated with the excess of temperature over 60° F. up to the end of the previous week, and the co-efficient found was about 0.80,

from which it may be inferred that a knowledge of the excess of temperature up to the end of that week would have enabled the number of cases of diarrhoea in the first part of the epidemic to be predicted fairly approximately, had not the great change to be described in the epidemiology of the disease occurred. When, however, a correlation is worked out between the excess of temperature before the twenty-eighth week and the number of cases in the whole summer epidemic, the correlation falls to about 0.45. A certain degree of accumulated temperature seems essential to provide the necessary impulse for the development of the epidemic, but some degree of permanence of the excess of temperature is required to maintain a high epidemic level. The matter, however, is pretty complex, and though a very large amount of work has been done, the return as yet has been small. We are convinced, however, that with a better method some further information might be obtained. The method used has been to calculate the ratio between the total cases of each week to those in the preceding week for a series of epidemics. A number, roughly twelve to twenty deaths, was first subtracted as representing the

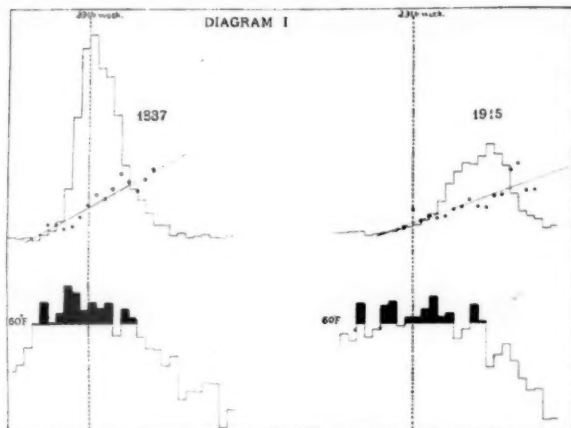


DIAGRAM I.—Showing the graphs of weekly deaths in London for the years 1887 and 1915, typical examples of the early and late forms of epidemic and the best straight lines drawn through the points denoting the ratios between the total cases of each week and those of the preceding week. The relationship to the fluctuation in weekly mean temperature is also indicated.

approximate winter level of the disease. This is very rough. However, the results thus obtained are interesting. In many epidemics the series of ratios lie roughly on a straight line. The ratios between the values of the ratios obtained by fitting a straight line and the actual ratios were next calculated. The variations found were correlated with the mean temperature of the previous week. The results were very variable; in most cases a negligible or zero correlation was found indicating that in those years the epidemic having received a sufficient impulse to development from the early rise of temperature, its form was little affected by the subsequent fluctuations in weekly temperature. Diagram I shows the points with the straight lines drawn through them on the graphs for the years 1887 and 1915, typical examples of the early and late forms of epidemic. In some years, however, an appreciable degree of

correlation was found indicating that in these the course of the epidemic might be influenced to some extent by the subsequent variations in weekly temperature, after the initial period of warmth had determined its general form.

On examining the weekly data for diarrhoea in the European cities it was found that the mean week of maximum mortality occurred about two weeks earlier in Moscow than in Berlin and Paris. In New York also the maximum mortality from diarrhoea occurred on the average fully two weeks earlier than in Chicago. The question arose whether this had a special relation to the course of the summer temperature. By harmonic analysis of the monthly mean temperatures—the weekly mean temperatures not being available—the mean week of maximum temperature was ascertained for each city. This was found to be practically identical in Paris, Berlin and Moscow, while in New York and Chicago the maximum again occurred in the same week, but a week later than in the European cities. There thus appears to be no obvious or definite relationship between the occurrence of the maximum temperature and the maximum fatality from diarrhoea.

The relationship of excessive rainfall to the prevalence of summer diarrhoea has been frequently the subject of inquiry. A period of excessive rainfall seems in some cases to be followed after an interval by a temporary decrease in the number of deaths from the disease and a consequent depression in the epidemic curve, and not uncommonly a period of excessive rainfall seems in close relation to the beginning of the decline of the epidemic; but, from the relation of the rainfall to the temperature curves, the effect can be explained on the supposition that the influence exerted by excessive rainfall is indirect, and that it acts mainly by reducing the temperature. This is the opinion generally held at present regarding the relationship between this meteorological factor and the prevalence of summer diarrhoea. Proof of this is furnished by the method of partial correlation, as this enables one to discriminate between the influence of temperature and rainfall. The coefficient obtained between the death-rate from diarrhoea per million per year in London and the rainfall in July for a period of thirty-five years was found to be -0.30 , that between the diarrhoea death-rate and the mean temperature of July $+0.65$. When the partial correlation between rainfall and diarrhoea is calculated, however, the temperature being assumed to remain constant, it is found to be zero, while the partial correlation between diarrhoea and temperature when rainfall is constant remains unaltered, indicating that the apparent influence of rainfall is in great part to be explained through its action in reducing the temperature. Dr. Stevenson (1911) [11] obtained similar results for diarrhoea and rainfall in London. It has been shown, however, in a previous paper, that a wet June by itself, apart from the other influences including temperature, while it does not affect the total amount of the epidemic, delays its maximum, the partial correlation between the amount of rainfall in June and the date of the maximum of the epidemic being 0.38 when the temperature is assumed to remain constant.

Before proceeding further, it must be definitely stated that the thesis that we seek to establish is that the epidemics of summer diarrhoea, though of a miscellaneous origin, are mainly composed of two separate diseases. Of these the first or early type of epidemic, as shown by the graphs, has its maximum in late July or early August, while that of the second is in September. While both types of epidemic exhibit an approach to symmetry, there is a difference in form and also in duration, the first having a steep ascent and a rapid decline, the second a more gradual slope throughout. On going over the sequence of epidemic curves it is possible to determine that a change has taken place in the

type of the epidemic; this became clearly indicated about the beginning of the present century. Up to 1899 the curves of the annual epidemics are fairly uniform in type with the maximum as a rule about the thirtieth week to the thirty-third week. In 1899 there is a change, and the epidemics appear to be occurring later in the year. The portion of the epidemic before the twenty-ninth week becomes smaller in proportion to the size of the epidemic, and the origin of the epidemic dating from that year is uniformly later, so that in the years 1900, 1901, 1904, 1905, 1906 and 1911, though the epidemic is of similar form to that experienced before 1899, it occurs later. The graphs for the years 1881 and 1911 in Diagram II have been chosen to show the changed maximum.

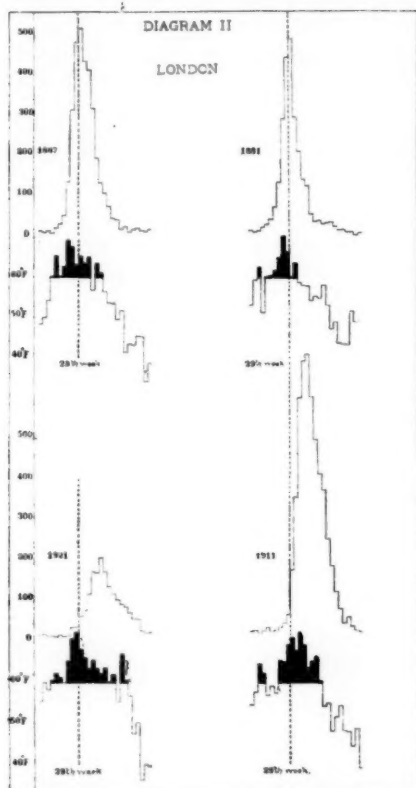


DIAGRAM II.—Showing the contrast between the graphs of weekly deaths in London for the years 1887-1921, typical examples of the early and late forms of epidemic and the graphs for 1881 and 1911 with a later maximum in the latter year. The relationship of mean weekly temperature over 60° F. is also indicated and the varying proportion of this preceding, or later than the end of the twenty-ninth week, which is denoted by a vertical interrupted line.

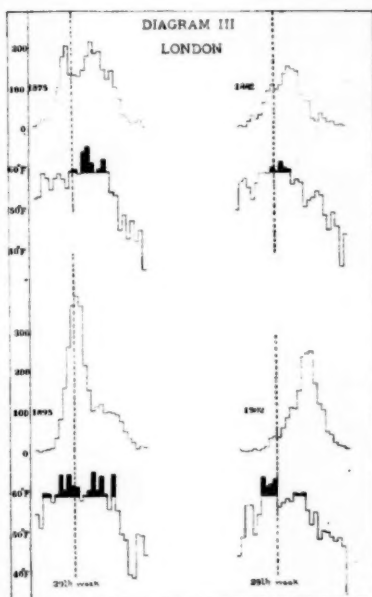


DIAGRAM III.—Showing the graphs of weekly deaths in London for the years 1875, 1882, 1895 and 1902, the first three of which illustrate the separation of the epidemic curve into its two constituent epidemics and the relationship to the weekly mean temperature over 60° F. The curve for the year 1902 is that of a typical late epidemic.

Again, from 1907 onwards, the maximum of the epidemic occurs yet further on in the year, namely, in the thirty-fifth to the fortieth week, and instead of a large epidemic occurring, with the single exception of 1911, the number of deaths is comparatively small. This phenomenon can be most easily explained on the supposition that the disease hitherto described as epidemic diarrhoea is not specific disease but a mixture of two diseases. A study of the charts seems to indicate that the first or early type has been predominant till 1899, but with an admixture of the second type which first became well marked on the epidemic curve of the year 1895, although in certain years before this date the form of the epidemic and the date of its maximum suggest the occurrence of an occasional epidemic of the later type and even in some years a partial differentiation of the two epidemics. The second type of the epidemic apparently became predominant in 1907 and has been constant since, with one exceptional year. The graphs for the years 1887 and 1921 in Diagram II have been chosen as typical examples of the early and late forms of the epidemic. The type and time relations of the epidemic curves for the last twenty years lead us to believe that the first type of diarrhoea has apparently disappeared or become nearly extinct and that the later type alone survives. Diagram III shows the graphs for the years 1875, 1882, 1895 and 1902 which illustrate the separation of the epidemic into its two constituent epidemics. In 1875 and 1882 partial differentiation of the early and late epidemics is seen; in 1895 the maximum of the late epidemic is seen as an elevation on the descending part of the curve of the first while the graph for 1902 shows a typical late epidemic.

These differences, however, are much more easily seen when an average of years is taken. For this purpose the corresponding weekly mortality figures for London have been summed for each decennium, a certain number, the winter level, deducted and the remainder graphed on a large scale on squared paper. Combination of the data of epidemics representing the course of other infections for a series of years smooths out the irregularities and shows a more uniform course than that shown in the individual years. The epidemic curves of diarrhoea for London for each decade are obviously decidedly asymmetrical, the descending limb being considerably longer than the ascending limb and exhibiting a definite hump or elevation. These decennial curves have been analysed into two normal curves. The axes of the latter were first chosen after a series of trials in the vicinity of thirty and thirty-six weeks, and after the necessary calculations had been made the composite curves were drawn; the corresponding ordinates of the two curves being summed and the sum compared with the original curve. If the theoretical composite curve seemed to vary from the original curve the positions of the axes were moved slightly in whatever direction seemed necessary, the values recalculated for two other normal curves, their ordinates summed and a second approximation to the original curve made. In some cases a third approximation was made to ascertain the position of the axes of the normal curves that would in combination give the best fit when compared with the original curve. It was found that by combining the normal curves obtained by this method very close fits to the original curves could be obtained and that the positions of the axes of the component curves which appeared to give the closest approximation were at the thirty-first and thirty-sixth weeks in the four decades, 1860-69, 1870-79, 1880-89 and 1890-99. In the decennium 1900-09 the means were at the thirty-third and thirty-seventh weeks and in 1910-19 at the thirty-seventh week. It is found, further, that as time progresses, the second constituent

forms a gradually increasing amount of the compound curve until in the decennium 1910-19 it almost wholly explains the original curve. The amount of the first epidemic in this case is so small that one normal curve fitted to the data with its mean at the thirty-seventh week gives a very complete description of the epidemic. The analyses of these decennial composite curves into the two

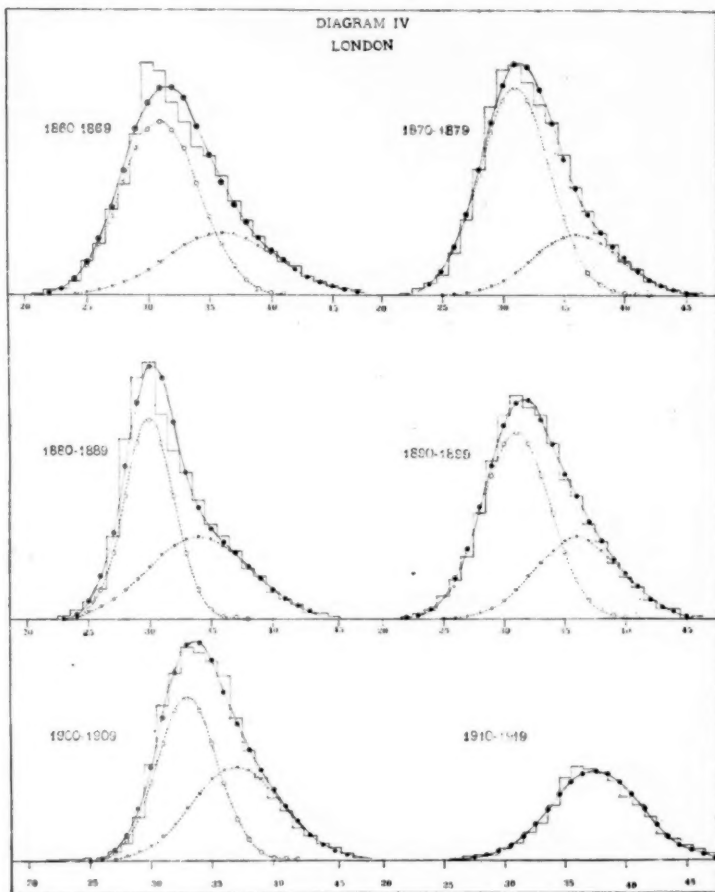


DIAGRAM IV.—Showing the analysis of the decennial composite epidemic curves for London into two symmetrical curves. In the last decade 1910-19, the data are fitted to one normal curve. The relative increase of the second constituent with the progress of time is indicated.

symmetrical curves which give the best approximation, and the manner in which the components of each vary with the passage of time, are shown in Diagram IV.

The fact, however, that the distribution of the composite epidemic can be fitted so approximately by the sum of two symmetrical curves, indicating two theoretical epidemics or two diseases with a distribution of this form, does not prove that the curve actually represents two diseases with this theoretical distribution; but the gradual increase of the later constituent in the average epidemics of the successive decennia till ultimately in the most recent decade

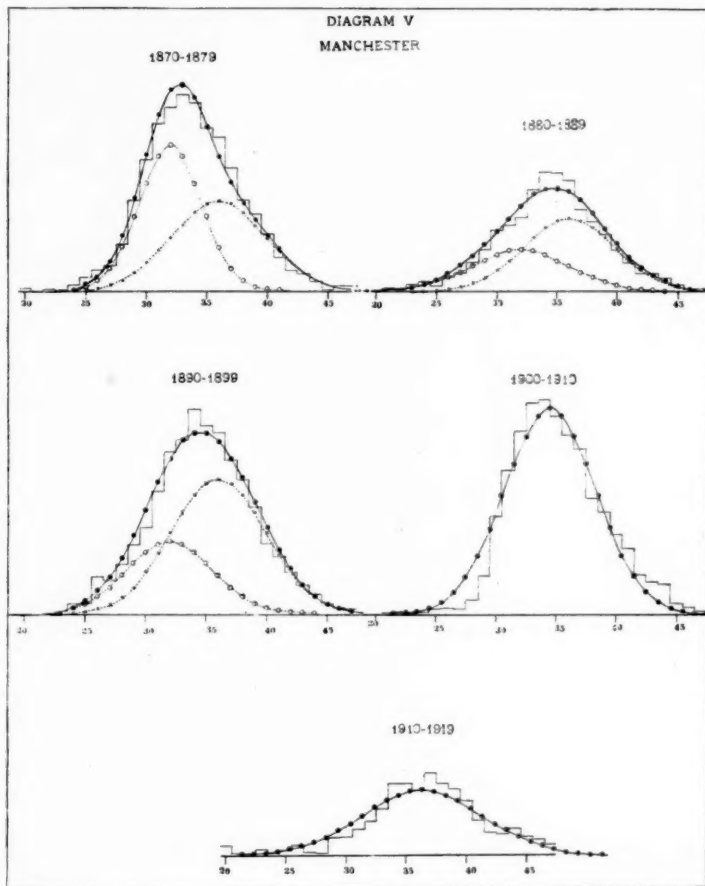


DIAGRAM V.—Showing the analysis of the decennial composite epidemic curves for Manchester into two symmetrical curves. In the last two decades the data are fitted to one normal curve.

it exists to the total exclusion of the first epidemic, and the close correspondence between this and the deduction from the study of the annual curves, suggest strongly that it is not a coincidence and that there is a reasonable and substantial basis for the advancement of the view that summer diarrhœa as

described is a composite disease which can be approximately represented by two symmetrical distributions attaining their maxima at different times, and that in recent years the earlier type has been replaced by the later type.

The decennial curves for Manchester from the year 1870 can likewise be represented fairly accurately by the sum of two symmetrical curves, the best approximation being obtained when the means of the constituent curves in the

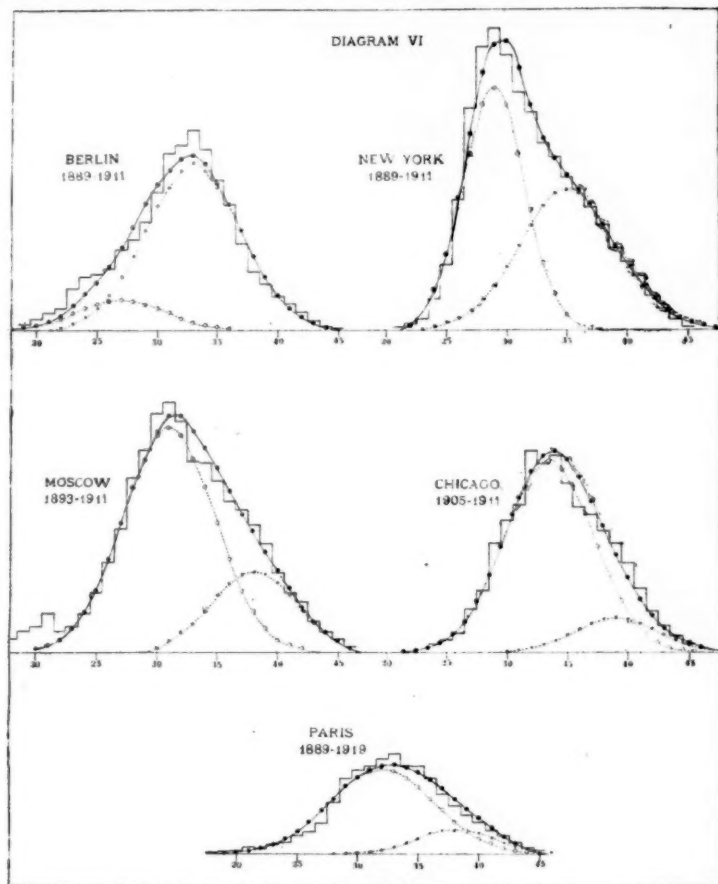


DIAGRAM VI.—Showing the analysis of the average weekly data for Berlin, Moscow, Paris, New York and Chicago into two symmetrical curves.

first three decades are placed at thirty-two and thirty-six weeks, while the curves for the periods 1900-09 and 1910-21, excluding the year 1911, can best be fitted by one symmetrical curve in each case with the axes in the thirty-fifth and thirty-seventh week respectively. The analysis of the decennial curves for Manchester into two symmetrical curves are shown in Diagram V, and it

will be seen that they are in close agreement with, and apparently support, the conclusions deduced from the London curves.

It is to be noted in this connexion that during the decade 1880-89 there was a marked decrease in mortality from zymotic diarrhoea in England as a whole. This is well seen in the diagram for Manchester, where the amount of the first epidemic is very small, the amount of the second epidemic actually exceeding that of the first. The data for Liverpool from 1870 have been similarly analysed and fitting to the sum of two normal curves, the best approximation to the original curves being obtained in the earlier decennia when the means of the constituent curves are placed approximately at the thirty-second and thirty-sixth weeks. The best fit for the last period 1910-21 excluding 1911 is again obtained by a single normal curve with its axis at approximately the thirty-seventh week. Thus the data for Liverpool are in agreement with those for London and Manchester. From the similarity in form of the average decennial curves for Birmingham to those of Manchester and Liverpool, it is permissible to assume that the former could be analysed in a corresponding manner.

The weekly data for a period of years for the several foreign cities have also been analysed in a similar way with a considerable measure of success (Diagram VI). For the average epidemic curve constructed from the weekly data for Paris for the period of years 1889-1919, the best approximation is obtained by fixing the axes of the constituent curves at the thirty-second and thirty-eighth week, for Berlin for the period 1889-1911 the means of the curves that give the best fit are found to be at the twenty-seventh and the thirty-third week, for Moscow, 1893-1911, at the thirty-first and thirty-eighth week, for New York, 1889-1911, at the twenty-ninth and thirty-fifth week, and for Chicago, 1905-11, at the thirty-fourth and thirty-ninth weeks respectively. In the case of the data for Berlin and Moscow, there are traces of an early epidemic in the vicinity of the twentieth week. This was smoothed out in analysing the bulk of the cases which occurred later in the year. The evidence, such as it is, supplied by the data for the foreign cities seems in favour of the thesis that in these also summer diarrhoea is a mixture of two epidemics, an early and a later type. The data for the analysis of the epidemic curves into two symmetrical curves are shown in Table I.

As it was found possible in the way described to fit the weekly data for the decennia in London to the sum of two symmetrical curves representing constituent epidemics in such close agreement with the deductions drawn from the charts showing the annual epidemic curves, an attempt was made to analyse by trial arithmetically the weekly data for each annual epidemic into two symmetrical curves in the period of years 1861-97. This was done by choosing in the weekly data the mean of the first epidemic, making the series of weekly deaths following the mean, symmetrical with that in front and trying, by varying the position of the mean selected, to leave a residual series approaching symmetry as nearly as possible. This was only a very rough method, but with the aid of the charts the data for each of the series of years in the period named above were subdivided in this way and the second series representing the second theoretical epidemic was in most cases approximately symmetrical. The numbers of the cases in the two approximately symmetrical series representing the theoretical early and late epidemics with the number of the week of their respective maxima were thus determined. For the whole series of years the maximum of the first epidemic varied from the twenty-seventh to the 33.5 week with a mean value about the thirtieth, while

TABLE I.—SHOWING THE ANALYSIS OF THE COMPOSITE EPIDEMIC CURVES INTO TWO SYMMETRICAL CURVES.

City	Period of years	Mean week of whole epidemic	Mean week of first or early theoretical epidemic curve	Mean week of second or late theoretical epidemic curve	Amount of first epidemic (per 1,000 deaths)	Amount of second epidemic (per 1,000 deaths)	Standard deviation of first epidemic curve (unit—one week)	Standard deviation of second epidemic curve (unit—one week)
London	1860-1869	32.7	31	36	662	338	3.18	4.52
	1870-1879	32.4	31	36	724	272	2.87	3.61
	1880-1889	31.9	30	34	536	461	2.03	4.17
	1890-1899	32.8	31	36	648	352	2.83	3.53
	1900-1909	34.9	33	37	535	465	2.46	3.68
	1910-1919 (excluding 1911)	37.5	—	37.5	0	1,000	—	3.74
Manchester	1870-1879	33.9	32	36	515	485	2.60	3.96
	1880-1889	34.5	32	36	375	625	4.05	3.84
	1890-1899	34.7	32	36	326	674	3.57	3.93
	1900-1909	35.2	—	—	not analysed	not analysed	—	—
	1910-1921 (excluding 1911)	36.5	—	36.5	0	1,000	—	5.02
	1870-1879	33.7	32	36	566	434	3.24	3.46
Liverpool	1880-1889	34.2	32	36	462	538	3.21	3.72
	1890-1899	33.3	32	36	646	354	3.50	3.83
	1900-1909	34.4	32	37	517	483	2.50	3.81
	1910-1921 (excluding 1911)	36.8	—	36.8	0	1,000	—	4.55
	1880-1919	33.0	32	38	835	165	4.32	3.06
	1905-1911	34.3	34	39	858	142	3.66	3.42
Paris	1880-1911	31.9	29	35	522	478	2.53	3.99
	1880-1911	32.2	27	33	141	859	3.67	3.96
	1880-1911	32.7	31	38	753	247	3.75	3.47
	1880-1911	32.7	31	38	753	247	3.75	3.47

that of the second epidemic varied from the 31·5 to the 39·5 week, with a mean maximum at approximately the thirty-fifth week. As a control the epidemic curve of one year was analysed into two symmetrical curves by the method of Professor Karl Pearson involving the solution of a nonic equation. The values found for the axes and areas of the constituent curves were in fairly close agreement with those determined by the approximate arithmetical method. With the theoretical values thus determined for the amounts and dates of the maxima of the constituent epidemics a series of correlations were calculated to determine in what degree their interrelations were in agreement with the deductions already made from the other data. For convenience of reference the two types of the disease, or the earlier and later epidemics, will be described in future as the summer and autumn epidemics. The number of cases in the first or summer epidemic as determined by this rough arithmetical analysis was correlated with the total degrees of temperature over 60° F. before the thirtieth week, and was found to be + 0·77, which is in fairly close agreement with that already found by taking the deaths before the end of the twenty-ninth week and the corresponding temperature in excess of 60° F. Now that this analysis has been made it is observed that with the accumulated temperature before the thirtieth week and the total amount of the epidemic the correlation is 0·77, showing that the low correlation of 0·45 obtained earlier is in all probability due to the dilution of the summer epidemic with a large number of deaths of different aetiology. Further, the correlation between the total excess of temperature over 60° F. and the number of deaths in the calculated summer epidemic is 0·73.

Quite different results are obtained when the excess of temperature is correlated with the autumnal epidemic. The correlation here is - 0·32. The method of analysis would, if the correlation were really zero, almost certainly bring in a negative correlation. This result is thus in close agreement with that found to exist between the temperature and the amount of the autumnal epidemic during the years when no summer diarrhoea has occurred.

It was suggested by one of us earlier that a late epidemic in one year is likely to be associated with a late epidemic in the following year. On correlating the dates of the maxima of the undifferentiated epidemics in successive years, however, for the periods 1856-98, in which the early type was predominant, the correlation found to exist between them was insignificant, while practically the same relation was found to obtain between the maxima of the successive epidemics in those years after 1900 when the late type of the epidemic was predominant. The relation previously found was thus probably due to mixed data.

We now come to consider certain other factors which have been supposed to have some causal relationship with epidemics of summer diarrhoea. Amongst these are included impure water and milk supplies and the prevalence of flies. The introduction of a pure water supply into Glasgow from Loch Katrine in October, 1859, was succeeded by a remarkable fall in the death-rate from diarrhoea. The changes that followed the substitution of this pure supply for Clyde water are described by Dr. Russell [10] (1895). Although the death-rate was not maintained at the low level to which it fell immediately after the substitution took place, it still remained considerably below the record of the previous years. Dr. Russell records the fact that the decline in the death-rate from diarrhoea that took place was mainly at middle ages, though to a slight extent in children under 1 year. Diarrhoea in children, therefore, does not depend so intimately upon the water supply as the diarrhoea

of adults. While the course of the diarrhoeal death-rate after 1859 showed that the improvement coincident with the change of water supply could not wholly be ascribed to the latter, this certainly was a very important factor. With a knowledge of the influence of a pure water supply in Glasgow and bearing in mind the relation of a polluted water supply to specific bowel complaints like enteric fever in the past, and that the water supply of the London area is derived from several different sources, we thought it desirable to determine if the mortality from diarrhoea was higher in the districts of London supplied with water from one source than in those districts supplied from another. For this purpose the deaths from diarrhoea from the twentieth to the forty-seventh week were extracted for each of the four years 1887,

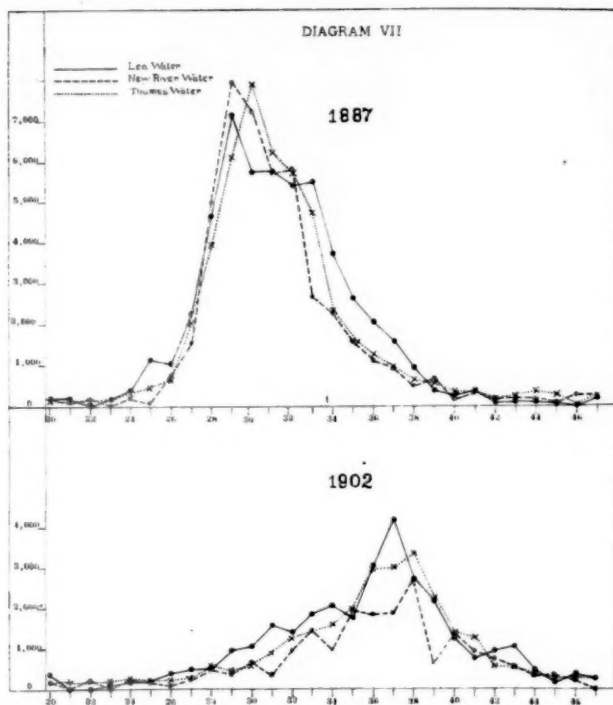


DIAGRAM VII.—Two composite graphs for the years 1887 and 1902 showing the weekly death-rate from diarrhoea per million of population in the areas of London supplied by the New River, River Lea and River Thames respectively.

1895, 1898 and 1902, for the areas in each of the districts of London supplied by the different companies, as well as for populations in the corresponding areas. The different sources of supply for which data were compiled were the Thames, the New River and the River Lea. The weekly death-rate from diarrhoea per million of population was calculated and comparable graphs prepared from the weekly death-rates in the regions supplied by the respective rivers, for each of the four years under review (Diagram VII). The graphs

showed no indication that any one source of supply had a special relation to excessive incidence of diarrhoeal mortality. The special point about this investigation arises in connexion with the fact that in the Lea Valley there has been storage of water on a large scale for many years, whereas in the case of the Thames, water storage on any considerable scale is only of comparatively recent introduction; while chlorination, also a possible factor in purification of water, was only introduced during the War.

Another explanation may be advanced—that diarrhoea is a disease propagated from the soil, and that the organism can multiply with increased ease in insanitary conditions. By 1898, London had become a vastly cleaner city. The London by-laws which enabled Sir Shirley Murphy to enforce this, came into effect in 1893 and during the next five years the improvement was progressive. It is, perhaps, no more than a coincidence that the first change in the epidemiology of the disease was observed in 1899 and that the maximum of the first epidemic then fell three or four weeks later, but the coincidence is suggestive. Further, towards the close of the first decade of the twentieth century, a very considerable replacement of horses by motor traffic had taken place, that in itself resulting in a great lessening of the amount of putrefiable matter contained in the city. At the end of 1910 it almost seemed as if a large part of the disease had disappeared, when the tremendous epidemic in 1911 bade us call a halt. This, however, has been the last flare up and in the most recent summer in which the temperature was equally favourable to a great outburst only a small autumnal epidemic occurred of quite average size.

The relation of the prevalence of flies to the incidence of the disease has now been investigated in a number of cities and has given rise to prolonged discussion, but this has by no means resulted in unanimity of opinion on the subject. Dr. Niven [7], Dr. Peters [8] and Dr. Dudfield [4] are strong advocates of a causal relationship between the prevalence of house flies and the incidence of diarrhoea; but Dr. Hamer [5], while admitting the close similarity between the seasonal epidemic curves of the disease and the number of flies, as indicated by the number caught from week to week, regards the view that the flies are the cause of the diarrhoea epidemic as not proven, and suggests that the similarity in the curves may be due to the existence of meteorological conditions which are favourable to both. In the course of investigation into this problem fly counts have been made in London under the supervision of Dr. Hamer, in Paddington by Dr. Dudfield, in Manchester under Dr. Niven and in Liverpool by Dr. Hope [6], and data regarding deaths occurring from diarrhoea and the number of flies caught in the corresponding weeks are now available for London for the years 1907, 1908, and 1909, in Paddington for 1911, in Manchester for the years 1904, 1905, 1906, 1908 and 1909, and in Liverpool for the years 1916, 1917, 1918, 1919 and 1920.

The graphs constructed for Manchester for the years 1904, 1905, 1906, and 1908, showing the number of fatal cases commencing and number of deaths in each week and prevalence of flies, as indicated by the number of flies caught in bell traps, show a remarkable similarity in form (Diagram VIII). In the years 1904 and 1905 the fly curve ascends practically simultaneously with the curve of the onset of fatal cases of diarrhoea, while in 1906 and 1908 the diarrhoea curve seems to lag a little behind the fly curve. In the year 1909, however, the curves for diarrhoea mortality, as indicated by the record of fatal cases commencing and the number of flies caught, do not exhibit the same parallelism. The diarrhoea mortality in this year was very slight, while

the prevalence of flies was considerable. The form assumed by the curves of flies and cases for the years 1904, 1905, 1906, and 1908, and their time relations to one another, strongly suggest that the prevalence of flies and the prevalence of summer diarrhoea are two phenomena which, while they may be dependent to some extent for their existence on similar conditions, probably largely meteorological, may be in part explained by the fact that the flies are responsible in a large measure for the dissemination of the disease. The curves constructed by Dr. Hamer for the years 1908 and 1909, demonstrating the relation in point of time between prevalence of flies, as indicated by the

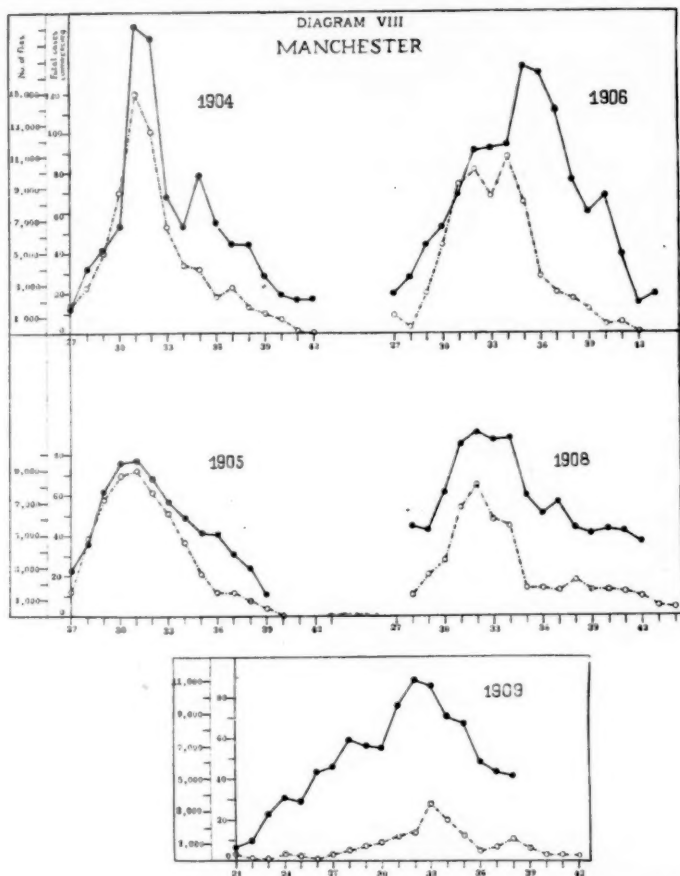


DIAGRAM VIII.—Graphs showing flies caught each week and weekly deaths from diarrhoea in the City of Manchester for each of the five years 1904, 1905, 1906, 1908 and 1909. As the average duration of fatal cases is about two weeks, the graphs of fatal cases have been moved back two weeks to indicate fatal cases commencing. The figures are taken from Dr. Niven's paper, "Summer Diarrhoea and Enteric Fever (1910)."

number of flies caught at certain centres and the number of deaths recorded from the disease, are very similar. This resemblance is not observed in 1907 (Diagram IX). In 1908 and 1909 the epidemic, though somewhat late in occurring, was of the summer type, but it was especially late and was definitely of the autumn type in the year 1907. While the similarity in the curves may be due to both conditions—excessive prevalence of flies and pre-

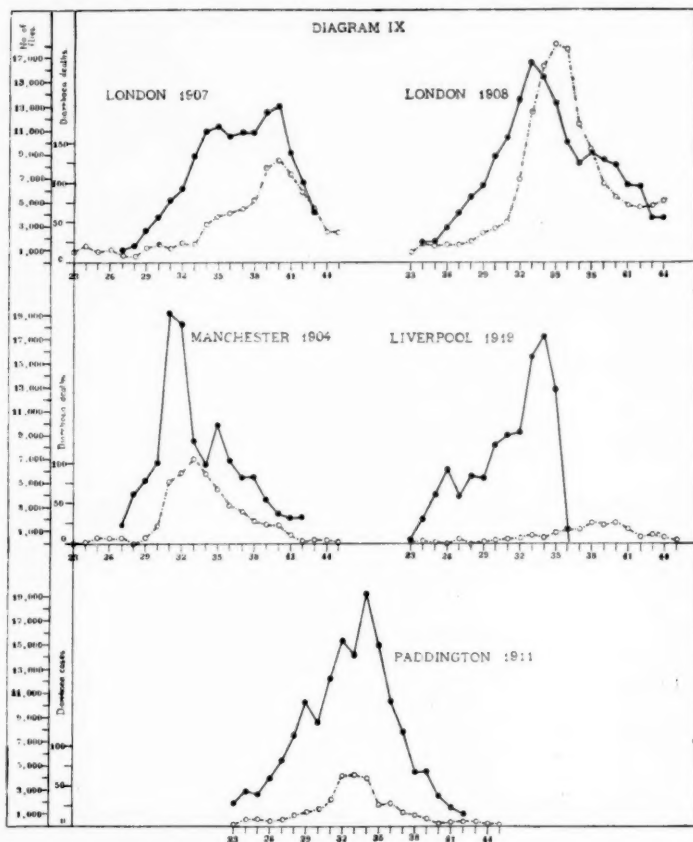


DIAGRAM IX.—Graphs showing the number of flies caught in each week and weekly deaths from diarrhoea in London for the years 1907 and 1908. There is not the close resemblance shown between the fly and diarrhoea curves in 1907 that is seen in 1908. There is also shown for Paddington a composite graph indicating flies caught and cases of diarrhoea recorded. Graphs indicating flies caught and deaths from diarrhoea are also shown for 1904 in Manchester and 1919 in Liverpool.

valence of diarrhoea—being dependent on similar meteorological factors, the agreement between the curves for 1908 and 1909 seems to suggest that excessive prevalence of flies may be influential in disseminating diarrhoea. On the other hand, the relationship between those for the year 1907 appears to indicate that certain other conditions are requisite, and that the prevalence

of flies has not the same influence in promoting the spread of the autumn type of diarrhoea.

Dr. Dudfield has correlated the prevalence of flies in Paddington with cases of diarrhoea and with deaths from diarrhoea, and obtains co-efficients of 0.75 and 0.78 respectively. The values of these co-efficients prepare one for a close similarity in the corresponding curves. The curves constructed by this investigator showing prevalence of flies and cases attacked by diarrhoea in Paddington in the year 1911 strongly suggest that flies may have some influence in dissemination of the infection. But the curve indicating the flies caught attains its maximum some time after that of the epidemic prevalence of diarrhoea, while the diarrhoea curve descends parallel to, but distinctly before, the fly curve. The diarrhoea prevalence apparently declines while flies are still very numerous (Diagram IX). This is a feature of some of the other curves for London and Manchester. The explanations that have been offered to account for this feature, namely, lessened motility of the fly at the end of the season or the presence of disease in the flies, seem inadequate. The decline of the diarrhoea epidemic before the decline in prevalence of flies has also been attributed to the exhaustion of susceptible persons; but though this may

DIAGRAM X
LIVERPOOL

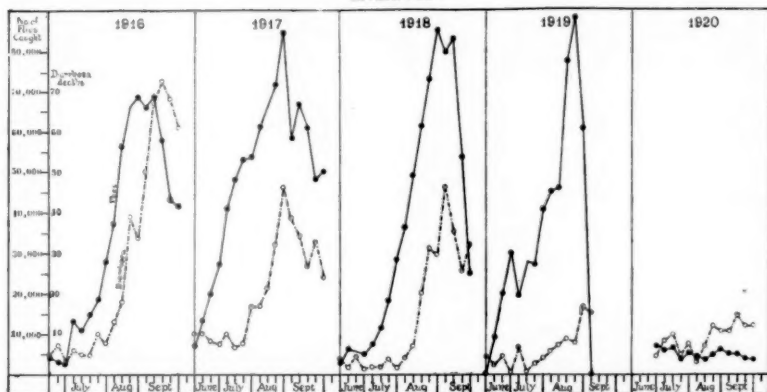


DIAGRAM X.—Showing the relationship between the prevalence of flies as indicated by the number caught and the deaths from diarrhoea and enteritis under 2 years of age in the City of Liverpool for the years 1916-20.

possibly have some effect, it is not supported by evidence relating to the decline of epidemic curves in other infectious diseases. This relationship of the two curves near their maxima seems opposed to the hypothesis that the prevalence of flies is responsible for the prevalence of the disease. The epidemic has attained its maximum at the middle of August, when flies must be still active and motile, as the maximum of the fly curve is not attained till early in September. There is less difficulty in accepting the hypothesis that flies are largely responsible for the disease if it be recollected that the fly is only an agent in its dissemination, and that the condition of the causal organisms is of equal, if not greater, importance. The decline of infectivity of the organism which has been shown to be the most reasonable explanation of the decline of an epidemic would be a sufficient explanation of the descent of the diarrhoea curve preceding that of fly prevalence.

Dr. Hope's curves for the City of Liverpool for the years 1916-20 (Diagram X) illustrating the correlation between prevalence of flies and recorded deaths from diarrhoea and enteritis from week to week in children under 2 years of age, while, in the main, seeming to furnish evidence in support of the thesis that flies are active agents in the spread of the disease, present some features that are difficult to interpret as being in favour of this view. The curves for the year 1916, in which the curve of deaths ascends closely parallel to and attains its maximum after that of flies caught, in which both flies and mortality are well marked, and the curves for 1920, a year associated with a very low summer temperature, in which diarrhoeal mortality was low and flies as indicated by the number caught were very few in number, suggest very strongly a causal relationship between prevalence of flies and mortality from diarrhoea. In the years 1917 and 1918 the curve of mortality from diarrhoea is also in fairly but less close agreement with the fly curve and attains its maximum at the same time as, or immediately after, the fly curve. On the other hand, in 1919, while the fly curve is as well marked as in the three previous years although showing a more rapid decline, the curve of mortality from diarrhoea is low and ill-developed and presents no evidence of agreement or parallelism with the curve of fly prevalence. In this year the diarrhoea curve ends abruptly in the first week of September and it is not clear that it has attained its maximum, but its form presents a powerful argument for the view that other conditions besides fly prevalence are requisite for the epidemic prevalence of summer diarrhoea. From a review of all the curves showing prevalence of flies and the coincident prevalence of, or mortality from, summer diarrhoea, and their time relations, the balance of evidence at present available seems to support the view that flies are active as disseminators of infection and have been responsible in a large measure for the prevalence of the disease in different years, although their prevalence does not seem to be so closely related to the autumnal type of epidemic. While this may be admitted, the curve of 1919 for Liverpool—and various anomalies in the other curves which have been regarded as providing difficulties in the acceptance of the theory of fly transmission, and which are easily explicable if the existence of a variable condition of the causal organisms is admitted and allowed for—serve to emphasize the importance of the latter and its share in determining the form and extent of the epidemics that have occurred in different years.

The autumn form of epidemic, typically marked in 1902 and 1903, is shown in each year since 1907 with the single exception of the year 1911. This, as already mentioned, is different in form from the type of summer epidemic. For some reason the earlier type of the disease has practically disappeared, and it remains for us briefly to discuss the agencies that may have been responsible for this change. There is no evident consistent change in the type or range of temperature curve to account for the change in form. In many years since 1907 the excess of temperature over 60° F. is such as would have given rise to typical summer epidemics or epidemics earlier in the year as in previous years. The temperature in the years 1914, 1917, 1919 and notably 1921 (Diagram II) should have provided the impulse for the development of extensive epidemics had conditions been similar to those in earlier years. Any inquiry into what other circumstances or agencies favouring or predisposing to the development of the disease have altered since the beginning of the century must include those other factors which are known or generally believed to have minimized the chances or lessened the opportunities for the dissemination of infection.

REFERENCES.

- [1] BALLARD, E. (1888), Report on Diarrhoea: Supplement to the Seventeenth Annual Report of the Local Government Board, 1887-88. [2] BROWNLEE, J. (1909), "Certain Considerations on the Causation and Course of Epidemics," *Proc. Roy. Soc. Med.*, 1908-9, ii (Sect. Epid.), pp. 243-258. [3] *Ibid.* (1914), "The Causes of Epidemics and the Laws which regulate their Course," Seventeenth International Congress of Medicine, London, 1913, Sect. 18, Hygiene and Preventive Medicine, 1914, p. 151. [4] DUDFIELD, R. (1912), "Diarrhoea in 1911," *Proc. Roy. Soc. Med.* 1912, v (Sect. Epid.), pp. 99-148. [5] HAMER, W. H. (1910), Reports on Nuisance from Flies, *London County Council Report*, 1910. [6] HOPE, E. W. (1920), Liverpool Annual Health Report, 1920. [7] NIVEN, J. (1910), "Summer Diarrhoea and Enteric Fever," *Proc. Roy. Soc. Med.*, 1910, iii (Sect. Epid.), pp. 181-216. [8] PETERS, O. H. (1908), "Season and Disease, a Preliminary Study," *Proc. Roy. Soc. Med.* 1908-9, iii (Sect. Epid.), pp. 1-58. [9] *Ibid.* (1911), "Observations upon the Natural History of Epidemic Diarrhoea," University Press, Cambridge, 1911. [10] RUSSELL, J. B. (1895), "The Evolution of the Function of Public Health Administration," Hodge and Co., Glasgow, 1895. [11] STEVENSON, T. H. C. (1911), Discussion on Dr. Dudfield's paper, "Diarrhoea in 1911," *Proc. Roy. Soc. Med.*, 1912, v (Sect. Epid.), p. 136.

DISCUSSION.

Dr. DUDFIELD said that he regarded flies as causal factors in connexion with diarrhoea only so far as those insects acted as carriers of the infecting micro-organisms be they Morgan's bacillus No. 1 or what not. The contrast between the summers of 1911 and 1921 was very striking, he thought, so far as the mortality from diarrhoea was concerned. He was inclined to attribute the low prevalence of the disease during the past year, in part, at least, to the change (in London) from horse to mechanical traffic. Such change had resulted in a very great reduction in the amount of manure stored near houses with the consequent elimination of foci for the breeding of flies and in the amount of manure pollution of road-dust. The road-dust, again, had been much lessened by the substitution of tar-mac and similar road surfaces for the old water-bound gravel and macadam. He was not prepared to accept without further inquiry all that the authors had said about the existence of two curves of prevalence of diarrhoea, although it was possible that the preponderance in recent years of the later (autumnal) curve of prevalence might explain a phenomenon for which he had been seeking an explanation—namely, the tendency which the disease now exhibited to prevail more extensively in the autumn than in the summer quarter of the year and to continue even after Christmas. At one institution in Paddington diarrhoea in the form of "infective enteritis" had, since the war, been a source of anxiety in the months of January and February.

Dr. HAMER said that great improvement in the scavenging of London was carried out at the instance of Sir Shirley Murphy in the early nineties; the by-laws requiring removal of house refuse at least weekly and prohibiting deposit near inhabited houses were passed in 1893. The possible influence upon diarrhoea prevalence of displacement of horses by motor cars had been suggested; but he had not so far been able to demonstrate excess of incidence of diarrhoea in thickly populated neighbourhoods near very large stables. The writings of Dr. O. Peters on seasonal influence were very interesting. Dr. Peters' views, so far as their bearing upon enteric fever was concerned, were summarized by Dr. Bulstrode, on p. 95 of the 1911 report, on "Shell-fish other than Oysters in Relation to Disease." As regards flies, no finally conclusive evidence in proof of the fly-bacillus theory could be obtained merely from comparing the seasonal curves of flies and of diarrhoea. The appeal must be made by upholders of the theory to the curve of prevalence of the "causal organism" of diarrhoea, when something came to be known about it. The fly-curve continued high after the diarrhoea curve had begun to fall, and at a time when the flies were not yet immobilized by fly fungus. A fascinating thesis was that propounded by Dr. Liefmann, of Halle, in the *Zeitschrift für Hygiene*, 1909.¹ He quoted the doctrine of Pfaundler that children sickened *ex alimentatione* and that they died *ex infectione*: and he commented upon the part played by secondary invaders, which, as he said, were "nosoparasites" or "facultative pathogenic organisms," to be carefully distinguished from "obligate pathogenic organisms."

¹ *Zeitschr. f. Hyg. u. Infektionskrankh.*, 1909, lxii, pp. 199-280.





Major-General Sir WILLIAM MACPHERSON asked Dr. Young whether in considering the factors, which influenced the curves of flies and epidemic diarrhoea, he made allowance for the measures which had been taken in recent years to disseminate information regarding the destruction of the breeding-places of flies and the protection of food from flies. Dr. Hamer had already referred to the influence of the advent of the motor-car in place of the horse in this respect. But, apart from that, the knowledge of the power of flies to disseminate intestinal disease was now very generally known amongst the people; and fly-proof kitchens and food stores were much more commonly seen than formerly. These measures had been adopted with great success in military garrisons of which he had experience, and, when they were thorough, flies and intestinal diseases practically disappeared. How far might similar measures have not been the prime factor in producing the very low fly prevalence curve and intestinal disease curve, which Dr. Brownlee and Dr. Young had shown for the year 1920, in Liverpool, as compared with previous years?

Dr. DAVID MCKAIL agreed with some of the previous speakers that it was very difficult to criticize such a paper on its delivery, and more especially when the thesis was based on charts which were displayed on the screen for a few minutes. If he had apprehended the argument rightly, he ventured to disagree with it entirely. It seemed to him unwise, except as a mathematical "jeu d'esprit," to take the statistics relating to epidemic diarrhoea and subject them to the various statistical methods, without first of all discussing the simple curves of prevalence in relation to clinical and other data, to see if there were any explanation that would fit in to all the facts. His recollection of these curves, was that in the years from the late nineties, there was a more or less continuous fall in the incidence of the disease (judged by the deaths) combined with a gradual delay in the week of onset of the epidemic. Was it not possible that the many and various measures taken in increasing amount during this very period had been effective in increasing the resistance to the actual and consenting causes of the disease, so that an outbreak did not occur until these causes had acted over a longer time? In such a case, having missed their "best" time, their virulence was apparently lessened, and the time for the accumulation of their effects much shortened, by the recurrence of the colder nights and the cooler days.

Dr. MCVAIL said that with reference to a statement made that 96 per cent. of deaths from infantile diarrhoea occurred in bottle-fed children, it would be important to know whether there had been any definite change in the manipulation of milk broadly coincident with the fall in mortality from the disease about the beginning of the present century. For example, if pasteurization had been largely adopted as compared with its use before the period in question, the question of cause and effect would arise. Ballard's work on the subject was carried out before the days of bacteriology, but it was worth recalling his opinion that in addition to diarrhoea from miscellaneous causes, there was a real specific infection, which sometimes appeared to him to exist in cases without looseness of the bowels. This had some resemblance to Sydenham's view that during small-pox epidemics there were cases of variolous fever without eruption. That opinion, however, might be based on his theory of an epidemic constitution of the atmosphere, leading him to think that when there was a variolous constitution, ill-defined fevers were variolous.

Dr. YOUNG (in reply) said that neither the date of its maximum nor the form of the curve was consistent with the simple explanation offered by Dr. McKail. With regard to the source of infection it had to be remembered that what was most important was what happened to the milk after it had reached the home of the consumer.

Section of Epidemiology and State Medicine.

President—Dr. A. K. CHALMERS.

Reforms needed in the Notification of Tuberculosis.

By REGINALD DUDFIELD, O.B.E., M.B.

THE Tuberculosis Scheme as we know it was the logical outcome of the publication in 1911 of the Final Report of the Royal Commission on Tuberculosis. The foundation stone of the scheme is notification, provided for by the Tuberculosis Regulations of 1912, on the completeness of which depends to a very great extent the success of the scheme. My experience as an Administrative Tuberculosis Officer has convinced me that the Regulations require amendments to secure better notification. I trust that, if you are unable to agree with the suggested amendments which I shall place before you, I shall at least be able to raise a discussion yielding practical results.

The aims of notification are primarily to secure that all tuberculous patients shall have the advantages of treatment under the scheme. In this connexion "treatment" has to be used in the widest possible sense and is not limited to the forms of medical treatment given in the general run of diseases. No one will question the extreme necessity for giving such treatment at the earliest possible date after the onset of symptoms. Indeed it is imperative that the commencement of treatment should not be delayed until diagnosis is beyond the region of doubt. The following remark by Mr. E. B. Turner [1] supports that opinion:—

"If a physician should suspect that a person consulting him is tuberculous, if what I called above his clinical sense makes him think that such be the case, even though at first it be uncorroborated by microscopical or laboratory tests, he should—if I may use such an expression—always give the patient the 'benefit of the doubt,' and treat him as if it were a case of phthisis."

A second and by no means unimportant aim of the Regulations is the collection of statistical data. Without reliable data as to the prevalence of tuberculosis, it is impossible to make adequate provision for the treatment of the disease, and without accurate knowledge of the changes in prevalence of the disease we are ignorant as to the success of the methods of treatment the ultimate aim of which is the stamping out of the disease. The letters published in the *Times* of March 4 last afford sufficient evidence that some doubt exists as to the efficiency and sufficiency of our present methods.

As an Administrative Tuberculosis Officer I may be excused for my greater interest in notification than in clinical treatment. My attention was first directed to the need of amendments to the present system of notification in 1919 when Dr. Menzies addressed the Metropolitan Medical Officers of Health and gave

in advance some figures which he had collected for the purposes of the Report on "Tuberculosis in London," subsequently published by the Medical Officer of Health of the County [2]. Dr. Menzies found that of 205 deaths from tuberculosis recorded in one of the Metropolitan areas during 1915, 64 (31 per cent.) occurred without previous notification; 39 (19 per cent.) occurred within one month after notification; and 34 (16 per cent.) occurred within six months after notification. From those figures it is evident that at least half the patients who died during the year had no chance of treatment under the scheme.

The Tuberculosis Officer of the Administrative County of Lancashire has published confirmatory statistics drawn from his area [3]. Analysing the deaths from pulmonary tuberculosis during the years 1914-18, he found that 19 per cent. of the fatal cases had not been notified at all; 1 per cent. of the fatal cases had been notified after death only; and 26 per cent. of the deaths had occurred within three months of notification.

During the eight years 1914-21 there were in Paddington 1,439 deaths from all forms of tuberculosis, 298 of those deaths representing cases which were unknown to me until registration of death. Further, in 106 instances notification was first made after the death of the patient. Those figures mean that the first intimation of the presence of tuberculosis in 404 persons—28·0 per cent., of all cases ending fatally during the eight years—was the death certificate.

Excluding the 106 notifications following death, there were 3,617 cases of all forms of tuberculosis notified during the same period, 247 (6·8 per cent.) with a fatal termination within one month after notification, 431 (11·9 per cent.) within three months and 546 (15·0 per cent.) within six months.

For the purpose of comparison with the figures given by the Tuberculosis Officer of Lancashire, the data relating to the deaths in Paddington from pulmonary tuberculosis during the years 1914-18 have been taken out separately. Of such deaths numbering 826 in all, 127 (15·3 per cent.) represented cases unknown to me at all; 43 (5·2 per cent.) cases notified after death only, and 265 (30·8 per cent.) cases terminating fatally within three months of notification. As regards the second and third categories the case was worse in Paddington than in Lancashire.

The loss of efficiency in the scheme may be stated in another way which will perhaps give a better idea of the case. Of the total of 3,723 cases notified during 1914-21, 106 were dead upon notification and 247 died within one month after notification, so that 353 patients (9·8 per cent.) could not be dealt with under the Scheme—a proportion which calls for amendment of the existing rules governing notification.

In the search for explanations of the leakage, "pulmonary tuberculosis" and "other forms" should be considered separately. I am not sure whether further subdivision is not desirable, but with the paucity of material available further subdivision would probably lead to wrong conclusions. I therefore limit this inquiry to the two main groups mentioned and deal with the defects in notification under the following heads: (1) Cases not notified to me at all; (2) cases notified after death only; and (3) cases terminating fatally: (a) Within one month; (b) from one to three months; and (c) from three to six months after notification.

In seeking for an explanation for these early deaths after notification, one should take into consideration what may be termed the normal duration of the disease. It has, however, been almost impossible to obtain data worth any minute analysis. It is difficult to get satisfactory histories in cases terminating very shortly after notification. Moreover, as regards pulmonary tuberculosis at

least, it is doubtful whether the onset of symptoms can be taken as synchronizing with the infection of the patient. This point was well brought out in a recent paper by Professor Lyle Cummings in opening a discussion at a meeting of the Naval, Military and Air Force Group of the Society of Medical Officers of Health [4]. After quoting the following conclusion of Fishberg he says:—

"Phthisis is a disease occurring in persons who have been infected with tubercle bacilli many years before the outbreak of disease. . . . Exogenic infection is exceedingly rare, if at all possible."

He gives the results of tuberculin tests on soldiers—in whom the existence of pulmonary tuberculosis should be negatived by the medical examination on enlistment—and of post-mortem examinations of men who died on service from diseases other than tuberculosis. Cummings' data confirm what has been reported by many earlier workers and the conclusion appears to be that pulmonary tuberculosis in the adult is but the reactivation of an infection acquired in infancy or youth. If that be accepted, a certain number of deaths at short intervals after notification must be regarded as inevitable, but what proportion should be so regarded it is impossible to say.

I now call attention to some recent work by C. H. Würtzen [5] dealing with the duration of pulmonary tuberculosis. His data are drawn from the records of the Tuberculosis Department of the Oeresund Hospital covering the period between April, 1906 (when the department was opened) and the end of 1919. The patients are described as townsfolk of the insurable and lower classes. In calculating the duration of the disease its onset has been taken as dating from the "appearance of symptoms"—"the exhaustion periods which so often preceded the usual chest signs" being reckoned as "symptoms" for this purpose. In doing that Würtzen ignores the possibility of an attack of pulmonary tuberculosis being the reactivation of a long acquired, but dormant, infection. From records relating to eighty-seven children (under 15 years of age) he obtains an average duration of 11·9 months, while for adults the averages are: Males (1,032), 37·1 months; females (780), 34·4 months; persons (1,812), 35·9 months. The shorter duration in the case of females is apparently due to child-bearing. The following durations I have obtained by re-grouping the data as published by the author.

AVERAGE DURATIONS (MONTHS).					
		Ages			
		15—	20—	45—	
Males	...	19·5	...	35·9	...
Females	...	21·2	...	33·8	...

Females aged 20-45 years formed 73 per cent. of the total cases among women.

(I) CASES NOT NOTIFIED TO ME.

I prefer this heading to the usual designation "non-notified cases" as I shall show that a proportion of such cases are notified to other medical officers of health but the certificates not transferred. These cases fall into two categories, viz., (a) those of persons dying within the borough; and (b) those of persons dying in outlying districts.

(a) *Local Deaths*.—These numbered 143 during the eight years: 77 from pulmonary tuberculosis and 66 from other forms. Analysed according to place of death, 23 (or 29·8 per cent.) of the pulmonary deaths took place in local institutions and 54 under the care of private practitioners. The 66 deaths from

other forms of tuberculosis were equally distributed between local institutions and private practitioners. After each death at home the medical attendant was asked for some explanation of the failure to notify, answers being received in most cases. Some candidly admitted that they had forgotten to notify, others pleaded ignorance of the Regulations, while a considerable proportion stated that they knew the deceased persons had been under the care of other practitioners (for tuberculosis) and that they therefore concluded that the cases had been notified. In a small proportion of cases the deceased persons had moved into the borough but a short time before death, and it was stated (and occasionally verified) that the cases had been notified in the districts whence the deceased came. As regards the deaths in institutions the inquiries showed that a large proportion of the cases were diagnosed at post-mortem examinations only, many of the deceased persons having been under treatment but a short time. In other instances the excuse was that it was thought that the cases had been previously notified.¹

I fear that the above statement is very incomplete, but on the whole my inquiries produced very similar results to those recorded by the Tuberculosis Officer for the County of Lancashire [6].

(b) *Outlying Deaths*.—Of the 155 deaths in outlying districts known to me after death only, 106 were due to pulmonary and 49 to other forms of tuberculosis. As the majority of transferred deaths occur in institutions, the fact that 92 (86·7 per cent.) of the pulmonary deaths took place in institutions and 42 (85·7 per cent.) of other forms does not mean much. It is worth noting that 60 of the 92 deaths from pulmonary tuberculosis in institutions occurred in lunatic asylums. My inquiries in connexion with deaths in asylums make it quite clear that the practice of medical officers of the institutions as regards notification varies. Certain admitted that they did not notify cases at all, others that they refrained from notification at the request of the medical officers of health of the districts in which the institutions were situated, and others again that they systematically notified cases to the local medical officers of health—but the certificates were not transferred to me. In this connexion I call attention to a letter from the (late) Local Government Board to the medical superintendent of one of the largest asylums in the neighbourhood of London. In that letter the Board stated that "Where . . . a patient has been for a long time an inmate of an asylum the Board are advised that the asylum should be regarded as the usual place of residence" of the patient for the purposes of the Regulations. The result is that while the death is allocated by the Registrar-General to the area whence the deceased was admitted to the asylum, no transfer of the notification certificate (if any be issued) is sent to the medical officer of health of that district.

The balance of the deaths from pulmonary tuberculosis in outlying institutions included 12 from institutions devoted mainly, if not entirely, to the reception of tuberculous patients, viz.: sanatoria, 6 (5 pulmonary, 1 other form), convalescent homes, 2 (one of each category), and "homes for the dying," 4 (including 3 pulmonary). Where such institutions are not "approved sanatoria," as defined in the Regulations of 1912, there is no obligation to

¹ The results of inquiries following 64 deaths which took place in Paddington at the homes of the deceased persons, gave the following figures: Death registered after inquest held, no medical attendant, 18; believed to have been notified elsewhere, 7; cause of death somewhat doubtfully tuberculosis, 8; no information obtained, 6; liability to notify overlooked, 12; "thought already notified," 14. The information obtained with regard to 32 deaths in local institutions: Diagnosis reached at post-mortem examination, 17; duration of treatment too short (including inquest cases), 6; notified outside the borough, 1; no information obtained, 1; liability to notify overlooked, 7.

notify the admission (or discharge) of a patient, but that observation applies to only a proportion of the institutions just referred to.

Recently the medical superintendent of a sanatorium refused to give information as to the origin of the certificate on which a patient had been admitted to his institution—such information being necessary to trace the medical practitioner who had failed to notify the case when the admission was arranged. The fact was reported to the Ministry of Health and a ruling asked for. To my surprise the Ministry held that the medical superintendent was not obliged to furnish the information sought.

As regards death elsewhere than in institutions, very little information has been obtained, partly on account of the long intervals which had elapsed between death and the receipt of the transfer. In certain instances, however, it was ascertained that the cases had been notified to the medical officers of health of the districts in which the deaths had occurred.

(II) NOTIFICATION FOLLOWING DEATH.

During the eight years 106 notifications were received after the decease of the patients—62 with respect to cases of pulmonary and 44 with respect to other forms of tuberculosis. Of the deaths from pulmonary tuberculosis, 34 (54·8 per cent.) took place in institutions, and of the deaths from other forms, 33 (75 per cent.). The deaths from pulmonary tuberculosis were nearly equally divided between local and outlying institutions—18 in the former and 17 (including 12 in lunatic asylums) in the latter—while those from other forms were mainly in local institutions (27 out of 32).

It has not been the practice to seek any information as to the reason for the apparent delay in notification, and hence, as regards cases dying in their homes, no conclusion can be reached as to whether the apparent delay is to be considered reasonably excusable. As the notifications received from institutions were on "Form A," the dates of admission have not been obtained in every instance. In the majority of instances, where such date was available, the duration of treatment in the institution was very brief. In a few instances it was known that notification certificates had been sent to medical officers of health of other districts.

(IIIA) PATIENTS DYING WITHIN ONE MONTH AFTER NOTIFICATION.

In this category there were during the eight years 247 deaths—197 from pulmonary and 50 from other forms of tuberculosis. Considered as cases the total (247) constituted 6·6 per cent. of all cases notified during the period—7·3 of the pulmonary group and 4·8 of the other forms. The deaths were 17·1 per cent. of the total—17·1 per cent. of those due to pulmonary, and 17·0 of those due to other forms. The proportion of deaths in institutions was 68·4 per cent.—65·5 for deaths from pulmonary and 80·0 for those due to other forms. I shall return to this question later.

I have already referred to the difficulties attaching to information as to the onset of the disease; so I am not submitting any tabulation of the supposed intervals elapsing before death. The decision to refrain from presenting such tabulation has been a disappointment, as I hoped when I began my inquiry to be able to deal exhaustively with the subject. A scrutiny of the imperfect data available leaves a strong impression that the disease—in its acute forms—was in the majority of instances of limited duration. It is, however, a fact

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which should be placed on record, that of the 45 deaths certified during 1914-21 to be due to "acute pulmonary tuberculosis" (Rubric 29a of the International Schedule of Causes of Death), only 18 fell within this group, i.e., those dying within one month after notification.¹ It should be observed, however, that comparatively few certificates of death afford evidence sufficient to justify classification under the Rubric, and that only such deaths as are definitely described as due to "acute pulmonary tuberculosis" are so classified.

(IIIb) PATIENTS DYING AFTER ONE MONTH, BUT BEFORE THREE MONTHS, FROM NOTIFICATION.

In this category there were 184 deaths during the eight years—162 from pulmonary and 22 from other forms of tuberculosis. Considered as cases, the figures are equivalent to 4·9 per cent. of all notifications—6 of pulmonary and 2·1 of other forms, while, as deaths, the percentages are: total, 12·7, pulmonary, 14·1, and other forms, 7·4. Reserving the full consideration of the deaths in this category which occurred in institutions, it may be remarked that of the total (184), 104 (56·5 per cent.) took place in institutions—89 (54·9 per cent.) from pulmonary and 15 (68·1 per cent.) from other forms.

In this group, again, the scanty information as to duration of the disease suggests short durations, but no reliance can be placed on the data.

(IIIc) PATIENTS DYING AFTER THREE MONTHS, BUT BEFORE SIX MONTHS, FROM NOTIFICATION.

The number of deaths which have to be allocated to this group numbered 115—108 from pulmonary and 7 from other forms. Those figures represent the following percentages of notified cases: total, 3; pulmonary 4, other forms, 0·6; the percentages of all deaths being: total, 7·9; pulmonary, 9·4; other forms, 2·3. Of the 115 deaths, 65 occurred in institutions, equal to 56·5 per cent., the figures for pulmonary and other forms being 60, 55·5 per cent., and 5, 71·4 per cent. respectively.

The foregoing figures relating to the deaths dealt with in the last three sections (III A-C) present a feature which is somewhat anomalous, namely, that the fatality of a disease in which a fatal issue may be regarded as almost inevitable is lower with longer durations (from notification). That observation is emphasized by the following tabulation, in which allowance is made for the instances in which death preceded notification:—

	Pulmonary	Other forms	All forms
Total cases reported	2,696	1,027	3,723
Less cases dead when notified	62	44	106
Cases effectively notified	2,634	983	3,617
Died within one month	197 (7·4)	50 (5·0)	247 (6·8)
Died 1-3 months	162 (6·1)	22 (2·2)	184 (5·0)
Died 3-6 months	108 (4·1)	5 (0·7)	115 (3·1)

The figures in () represent percentages of effective notifications.

Assuming the validity of the foregoing arithmetic, the question naturally arises: Do the cases which ended fatally within six months of notification

¹ The distribution of deaths certified due to "acute pulmonary tuberculosis" during the eight years is: Died before notification, 4; not notified to the department, 3; died within one month of notification, 18; from one to three months after notification, 11; from three to six months, 3; and over six months, 6.

TABLE I.—PULMONARY TUBERCULOSIS.
Percentage Distribution.

Intervals between notification and death (months)	At ages— 0—		5—		10—		25—		35—		45—		55—		65—		75—		All ages	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
0-1	3-47	3-65	3-47	4-87	6-95	17-07	15-65	14-03	19-13	21-95	25-21	19-51	20-00	9-75	6-08	6-09	—	2-43	58-37	41-62
1-3	3-75	6-09	8-75	7-31	22-50	20-73	17-50	23-17	22-50	23-17	20-00	8-53	8-75	9-75	1-25	1-21	—	—	49-38	50-61
3-6	3-44	2-00	3-44	2-00	18-96	46-00	15-51	18-00	31-03	32-00	13-79	6-00	10-34	2-00	3-44	2-00	—	—	53-70	46-29
0-6	3-55	4-20	5-13	5-14	14-61	25-23	16-20	18-69	22-92	22-42	20-94	12-13	12-64	7-94	3-95	3-95	—	0-93	54-17	45-82
6+	2-91	2-40	16-36	15-60	17-65	21-40	23-22	29-00	19-36	16-70	13-02	8-10	4-88	4-50	2-39	2-10	0-17	0-20	53-85	46-14

Index Numbers (a).																				
0-1	119	152	21	31	39	79	47	50	99	131	194	241	410	217	254	290	—	1215	108	90
1-3	129	254	53	47	127	97	75	82	116	139	154	165	77	217	52	58	—	—	92	109
3-6	118	83	21	13	107	215	67	60	160	132	106	74	212	44	144	95	—	—	100	100
0-6	122	175	31	33	83	118	70	64	118	134	161	150	259	176	165	165	—	465	100	99

(a) Proportion for each sex-age group of "6 + duration" = 100.

TABLE II.—OTHER FORMS OF TUBERCULOSIS.
Percentage Distribution.

Intervals between notification and death (months)	At ages— 0—		5—		15—		25—		35—		45—		55—		65—		75—		All ages	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
0-1	75-00	53-33	20-00	30-00	5-00	6-66	8-33	10-00	—	3-33	—	—	—	6-66	—	—	—	—	40-00	60-00
1-3	41-66	50-00	8-33	10-00	—	—	8-33	10-00	33-33	10-00	—	10-00	—	10-00	8-33	—	—	—	54-54	45-45
3-6	25-00	33-33	—	—	—	—	—	—	25-00	66-66	25-00	66-66	25-00	6-97	2-77	—	—	—	57-14	42-85
0-6	58-33	51-16	13-88	23-25	2-77	4-65	2-77	2-32	13-88	4-65	2-77	6-97	2-77	6-97	2-77	—	—	—	45-56	54-43
6+	22-50	19-33	53-95	46-69	10-41	15-80	5-20	9-43	3-95	5-18	2-29	2-35	0-83	0-94	0-41	0-23	0-41	—	53-09	46-90

Index Numbers (a).																				
0-1	333	276	37	64	48	42	—	—	—	64	—	—	—	709	—	—	—	—	75	128
1-3	185	259	15	21	—	—	160	106	843	193	—	425	—	1064	2082	—	—	—	103	97
3-6	111	172	—	—	—	—	53	25	683	2837	1092	2837	3012	—	—	—	—	—	108	91
0-6	254	265	26	50	27	29	—	—	351	90	121	297	333	741	676	—	—	—	86	116

(a) See note to Table I.

form a random sample of all notified cases? To answer that question the sex-age distribution of the notified cases has been taken out in five categories, viz.: (a) All notified cases; (b) cases notified after death only; (c) cases ending fatally within one month of notification; (d) those ending within one to three months; and (e) those ending within three to six months.

The difference between (a) and (b) gives what may be termed the "effective notifications," and subtracting the sum of the figures obtained by (c)-(e) the numbers of "survivors" are obtained. The percentages found in the different sex-age groups of the "survivors" have been taken as the standards for calculating Index Numbers for the three groups (c)-(e)—0-6 months. The numbers thus obtained are shown in Tables I and II (p. 81). The figures appear to show that the cases fatal within six months after notification do not constitute a random sample—even if the comparatively small numbers dealt with be recognized. The proportions of males (all ages) and of females are different in all the three groups, 0-6 months, and the sex-age numbers show some startling differences. It is much to be desired that this question should be considered with larger samples than can be furnished from one sanitary district, but for reasons which will become apparent later on, I fear that such consideration is impracticable at present.

Another argument supporting the view that the "0-6 months" sample is not a random one seems to be furnished by the differences in the proportions dying in institutions, and, possibly, by the class of institution in which the patients died. Of the pulmonary cases dying within six months after notification, 59·5 per cent. died in institutions, as compared with 44·2 per cent. of the six + months' survivors. Splitting up the deaths 0-6 months into the three groups already used, the percentages are found to be: for 0-1 month, 65·5; one to three months, 54·9; and three to six months, 43·4. Similar differences are to be observed in the case of other forms of tuberculosis, the percentages being: 0-6 months, 75·9; survivors (six + months) 72·7; and 0-1 month, 80; one to three months, 68·2; and three to six months, 71·4. Without laying too much stress on the opinion, I am inclined to think that the patients whose cases terminated fatally within six months after notification were, on the whole, younger than the survivors, and that the type of their disease was more acute.

TABLE III.

	Pulmonary					Other forms				
	Months—					Months—				
	0-1	1-3	3-6	0-6	6+	0-1	1-3	3-6	0-6	6+
Dying after notification ...										
Percentages of all deaths occurring in institutions ...	65·5	54·9	43·4	59·5	44·2	80	68·2	71·4	75·9	72·7

Percentages of Institutional Deaths.

	0-1	1-3	3-6	0-6	6+	0-1	1-3	3-6	0-6	6+
Lunatic Asylums ...	13·2	12·3	1·7	10·4	3·1	—	—	—	—	10
Hospitals, M.A.B. ...	2·3	19·1	26·7	12·9	13·5	—	6·7	40	5	17·5
Hospitals, other ...	10·8	7·9	10	9·7	5·7	32·5	—	—	21·7	30
Poor Law Institutions	70·3	53·9	53·3	61·5	66·1	67·5	93·3	60	73·3	37·5
Sanatoria (a) ...	—	4·5	1·7	1·8	—	—	—	—	—	5
Convalescent Homes	—	—	—	—	—	—	—	—	—	—
Homes for Dying (b) ...	3·1	2·2	6·7	3·6	11·4	—	—	—	—	—

(a) Other than those provided by the M.A.B. (b) Excluding "Advanced Cases" hospitals (M.A.B.).

Attention may be directed to the class of institution in which the patients in the various groups died. The figures are set out in Table III. The figure which will attract immediate attention is the surprisingly large proportion of deaths which take place in Poor Law institutions. As regards those institutions, it is noteworthy that the percentage is higher in the case of the survivors (pulmonary six + months) than in the "all notifications" or "died 0-6 months" groups. The fall in the proportion of pulmonary cases dying in lunatic asylums from 10·4 per cent. of institutional deaths for the 0-6 months' group to 3·1 per cent. for the survivors, does more than suggest, I think, the shortness of the disease in such institutions.

The first criticism I anticipate of the figures submitted is that the war furnished ample excuse for any failure of the scheme. To meet that criticism, I submit the following observations.

Taking the cases known only after death as the measure of failure, my records show that for the four years, 1914-17, 130 cases of pulmonary and 87 of other forms of tuberculosis were not heard of until after death, representing 18·9 per cent. of pulmonary, and 53·3 per cent. of other forms. In the four years 1918-21, the percentages were 25·1 for pulmonary and 54·9 for other forms—representing an increase of over 32 per cent. for pulmonary and just over 3 per cent. for other forms. If the eight years be divided into two periods of five years (1914-18 regarded as the war period) and of three (1919-21, peace or settling period), the following percentages are obtained:—

		Pulmonary	Other forms
1914-18	...	20·5	53·1
1919-21	...	24·1	56·4
Percentage increases	...	17·5	6·2

In other words, during the return to peace conditions, there has been an actual increase in the proportion of cases not known during life to those concerned with the work of the scheme. It may be, I think, concluded that serious defects do exist in the rules governing notification.

Sufficient evidence has, I think, been adduced as to the need of amendments in the administration of the scheme, if the true aim and intention of the scheme is to be achieved, that is, that every person suffering from tuberculosis shall be in a position to take advantage of the benefits of the scheme, if he so desire. Before passing to the amendments which I propose to put before you, I think it will be useful to see if evidence can be adduced as to any benefit which has accrued from the operations of the scheme. I cannot disguise from myself the fact that the few statistics which I am about to submit suffer from two, and possibly more, defects. In the first place being drawn solely from my own district, the numbers available are comparatively small and may not constitute a random sample. The difficulties attaching to the compilation of statistics for large areas is a matter with which I shall deal at the end of this paper. The second defect in my statistics is the fact that I am unable to satisfy myself that the improvement in the prevalence of tuberculosis to which I have to direct your attention is not due to causes independent of the working of the scheme. The question could only be answered by an extended inquiry, for which I have neither the time nor the material.

I may remind you that compulsory notification of (pulmonary) tuberculosis was initiated by the Order of 1908, but was limited to cases under the care of the Poor Law. In March, 1911, notification (also of pulmonary tuberculosis

only) was extended to cases under treatment in "institutions" and further extended by the Order of December of that year to all classes of patients suffering from that form of the disease. The Regulations of 1912 repealed the three earlier orders and applied notification to all forms of tuberculosis. Consequently notification is to be assumed to have been "complete" since January 1, 1913. In that year, 664 cases were notified to me; 492 of pulmonary type and 172 of other forms. Since that year, with the solitary exception of 1915, the numbers reported annually have decreased.

The number of cases reported in 1913 was, I think, altogether exceptional, and represented, not the number of cases diagnosed during that year, but the total of cases of tuberculosis—especially of other forms of tuberculosis, pulmonary cases having been notified for some three years—which were then under treatment, many, doubtless, diagnosed some time previously. I do not, therefore, propose to make any use of the figures of that year. Further, it appears to be unnecessary to give the actual numbers of cases reported, percentage variations (index numbers) affording, I think, more useful indications of the changes in prevalence during the period under review. I may add that the population of Paddington has increased slightly since the census of 1911, but I have no knowledge as to the intercensal changes in the sex-age composition of the population. In any case it cannot be said that the lower prevalence which my figures indicate, is due to shrinkage of population.

Cases Reported.—Table IV shows that there has been a fairly regular fall in the index numbers for all forms, all three numbers for 1921 being 39 points

TABLE IV.
Cases Reported.

				Records	Index numbers (a)						
				1914	1915	1916	1917	1918	1919	1920	1921
All forms	...	...	...	545	108	96	92	83	72	70	61
Pulmonary	...	...	...	397	107	98	89	82	71	70	61
Other	...	...	...	148	111	93	99	85	72	72	61

Deaths Registered.

All forms	186	115	113	129	99	71	78	67
Pulmonary	151	115	118	122	92	69	79	62
Other	35	114	91	166	131	80	74	88

(a) Records for 1914 = 100.

below the standard. If the eight years be divided into periods of four years each, a fall of 28 points will be observed in the numbers for the second period. The same result is obtained if the eight years be divided into two periods of five years—1914-18 (war period) and three—1919-21 (peace period).

Deaths Registered.—The index numbers of deaths registered (*see* Table IV) have varied somewhat irregularly, but the number for all forms in 1921 is 33 points below the standard. The irregularities observed have been due to the fluctuations in the numbers of deaths from other forms of tuberculosis, the

1921 number for that group being only 12 points below the standard. Comparing the annual averages for 1914-17 and 1918-21, decreases in the index numbers for the second period have been found to be: all forms, 31 points; pulmonary, 33; other forms, 20. Comparison of the averages for the "war" and "peace" periods already mentioned shows falls of: all forms, 35 points; pulmonary, 36 points; other forms, 32.

TABLE V.

A.—Deaths from Tuberculosis.

				Ratios, C : D :: 100	Index numbers (a)						
					1914	1915	1916	1917	1918	1919	1920	1921
All forms	...	...	...	34.1	106	117	140	120	100	111	109
Pulmonary	...	...	...	38.0	107	121	136	112	97	114	101
Other	...	...	...	23.6	103	98	161	154	111	104	144

B.—Deaths from All Causes.

All forms	38.7	103	112	134	130	101	112	106	
Pulmonary	44.0	97	112	129	126	99	112	98	
Other	24.3	123	110	165	169	115	112	149	

(a) Records for 1914 = 100.

Fatality.—Without claiming the same statistical value, or clinical significance, which the ratio of deaths to cases possesses (say) in the case of the epidemic infectious diseases, I think that a secular comparison of the "fatalities" recorded year by year will be found instructive in connexion with the question now being considered. To arrive at these "fatalities" two sets of ratios have been calculated in both of which the annual numbers of cases reported have been used, but in the first series of "fatalities"—Section A of Table V—only deaths belonging to the borough which were certified as due to tuberculosis were taken into account. In the second series—Section B of Table V—to the deaths mentioned have been added deaths of patients notified as tuberculous dying from causes other than tuberculosis and deaths of such patients which, although not "transferred" to Paddington by the Registrar-General, have come to my knowledge. The causes of death in the last group are unknown to me. I hope you will admit that I have done my best to include in the second series of calculations all deaths among notified cases of tuberculosis during the period under review.

Reference to Section A of Table V shows the numbers for all forms have been in each year since 1914 above the standard, the increase ranging from a maximum of 40 points in 1917 to a minimum of 6 points in 1915. In the case of pulmonary tuberculosis the only year with a number below the standard is 1919, when there was a fall of 3 points, the 1921 number being, however, only one point up. The numbers for other forms have varied most irregularly, with a maximum increase of 61 points in 1917 and a maximum fall of 2 points in 1916. The 1921 number is up 44 points. The numbers given in the B Section do not vary so greatly, those for pulmonary tuberculosis

showing falls in three years, viz. 1915 (3 points), 1919 (1 point) and 1921 (2 points).

Comparison of the average ratios for the two four-year periods and for the "war" and "peace" periods are not quite so disappointing. Taking the "fatalities" in Section A of Table IV, the number for the second period of four years (1918-21), for all forms, shows an increase of one point only, that for pulmonary a fall of 8 points and that for other forms an increase of 11 points. The numbers for the "peace" period (1919-21) falls for all three numbers: 8 points for all forms, 9 for pulmonary and 3 for other forms. Comparing the averages of the fatalities in Section B, I find that the 1918-21 numbers, for all forms and for forms other than pulmonary, show increases of 2 and 10 points respectively, but no change in pulmonary. The numbers for all forms and pulmonary in the "peace" period (1919-21) show falls of 8 points each, while that for other forms shows a rise of 1 point only.

I must confess that the statistics just quoted have been disappointing, but I believe they do afford some slight evidence that work under the scheme has been useful. When one thinks of the conditions which prevailed during the war, the food shortage and the strain upon women working in munition factories, &c., most of whom were unaccustomed to hard muscular work, it is satisfactory to record the small reductions in the index numbers for the "peace" period, which, moreover, has been too short to allow of recovery from most of the evils of war. I think that we may look forward to better results as conditions improve, but it will require the passage of a good many years to eliminate all the sequelæ of the war.

One fact which emerges from the inquiry by Würtzen seems to support my view that good results have already been obtained by the "campaign" against tuberculosis. It is remarkable that Würtzen has not called attention to this. In his principal table (pp. 27 *et seq.*, loc. cit.), he gives for each year the number of deaths and the total duration of the attacks represented by those deaths, but he has not calculated the durations for individual years. I did that as a matter of curiosity and I find that there has been an increase in the duration during the later years. During the years 1906-14, the average durations were: males, 36·6 months; females, 33·2; while for the period 1915-19, they were: males, 37·8 months; females, 35·9. There were, therefore, increases of 1·2 months (for males) and 1·7 months (for females)—nothing very striking, perhaps, but it must be remembered that when the inquiry was closed at the end of 1919, the economical situation was not back at anything like peace level.

My own view is that to secure better results than have been achieved since 1913, the administrative side of the scheme must be tightened up, and the first essential is improvement in notification.

Article V of the Regulations reads as follows:—

Subject to the provisions of the Regulations every Medical Practitioner (unless acting as a School Medical Inspector) attending on or called in to visit any person (whether at an Institution or otherwise) shall, within forty-eight hours after first becoming aware that such person is suffering from tuberculosis, make and sign a notification of the case in Form A, and shall transmit the notification to the Medical Officer of Health for the District within which the place of residence is situate at the date of notification;

Provided that a Medical Practitioner shall not notify a case of Tuberculosis under this Article if he has reasonable grounds for believing that the case has already been

notified . . . to the Medical Officer of Health for the District within which the place of residence of the person is situate ;

Provided further, that if a notification is required in pursuance of this Article in respect of an in-patient at an Institution the notification shall be sent to the Medical Officer of Health for the District in which the usual place of residence of the patient is situate.

According to my experience the first of the two provisos ought to be repealed, as it is a source of leakage. Replies to letters asking for explanation as to failure to notify are frequently based on this proviso, the practitioner pleading either that he knew the patient had been seen by another practitioner and he (the first practitioner) concluded, or supposed, that the other had notified, or that the patient had only recently come under his care from another district and he concluded that the case had been notified (frequently, not) to the medical officer of health of the district whence the patient had come and that, therefore, further notification was not required. In addition to repealing the first proviso, an addition is required to the first paragraph of the Article requiring the medical practitioner to repeat his notification should the patient move into a new district and the practitioner continue in attendance. Strictly reading the concluding lines of the paragraph, such repetition of notification is required by the Article as it stands, but the requirement appears to be misunderstood.

As regards the second proviso, I think it is desirable that the certificate should be sent to the medical officer of health of the district in which the institution, and not the patient's home, is situated. Certificates relating to patients residing in outlying areas would be transferred to the medical officers of health of the appropriate areas by the medical officer of health receiving the certificates. Such change would bring the notification of tuberculosis into line with the practice relating to the notification of other diseases.

One other amendment of a radical character appears to be desirable in this and certain other Articles, viz., the provision of notification of "suspect" cases. This amendment appears to be the more necessary as institutional treatment is now available for "suspect" cases for the purposes of observation. It seems to be desirable that such "suspect" cases should be followed up to ensure early treatment of any untoward symptoms which may develop after a discharge following residential observation. I do not suppose that I shall secure general support for this proposed extension of notification, but I am of opinion that such amendment is, and will be generally recognized later on as, necessary if we are to obtain the fullest benefit from any tuberculosis scheme.

Article VII provides :—

The Medical Officer of a Poor Law Institution or of a Sanatorium, shall as soon as practicable after the end of each week :

- (a) make and sign a notification in Form C of all cases of Tuberculosis admitted during the week and not being cases which are required to be notified under Article V of these Regulations, and transmit the notification to the Medical Officer of Health for the District within which the places of residence of the persons notified are situate ; and
- (b) make and sign a notification in Form D of all cases of Tuberculosis discharged during the week, other than cases transferred to a Poor Law Institution or a Sanatorium, and transmit the notification to the Medical Officer of Health for the District within which the places of destination of the persons notified are situate.

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When the places of residence, or the places of destination, as the case may be, of the persons to be notified are situate in more than one District, a separate notification shall be transmitted to the Medical Officer of Health of each District.

A "sanatorium" is any residential institution approved by the Minister of Health for the treatment of tuberculosis. (Article I of the Regulations, 1912, as amended by Article II of the Regulations, 1921.)

The time has come for the above provisions to apply to all institutions, and not only to institutions, other than Poor Law, approved by the Minister of Health. The Article should also apply to "suspect" cases admitted for observation. The reference to Form A appears to be unnecessary, as it is to be assumed that primary notification will have been made by the practitioner who arranges for the admission of the patient to the residential institution. Should a case be first notified on Form C (or, as sometimes happens, on Form D) the medical officer of the institution should be required by the Regulations to furnish the medical officer of health with the name and address of the practitioner who arranged for the admission of the patient, should the medical officer of health ask for such information.

When a patient is admitted from one address and discharged to another, the discharge should be notified to the medical officers of health of the two districts. If this amendment were adopted the medical officer of the district from which the patient was admitted would be able to forward to the medical officer of health of the district to which the patient was discharged, the "dossier" of the case without loss of time. When a patient is admitted from (say) Paddington but gives the institution's officials an address in (say) Hampstead, Form C should, I think, be sent to Paddington, not Hampstead.

As at present drawn the Article requires the admission to a sanatorium, or Poor Law institution, to be notified on Form C, even after "transfer," but does not require the transfer-discharge to be notified on Form D. Such provision leads to incomplete record of the institutional treatment which a patient receives and results in an excess of admissions over discharges (and deaths).

It would, I believe, be an advantage were notifications from every institution addressed to the medical officer of health of the county in which the institution is situated, the medical officer of health of the county being made responsible for the distribution of the information to the medical officers of health of the districts in which the patients' homes are situated.

Article VIII directs that a diagnosis of tuberculosis shall not be based solely on the results of the tuberculin test. Whether anyone would notify a case relying on a positive result apart from clinical symptoms, I very much doubt. On the other hand I believe delay does occur, and opportunity of immediate treatment is lost, through refusal to notify until the tubercle bacillus has been demonstrated in the sputum of patients suffering from pulmonary tuberculosis. I do not wish it to be thought that any practitioner should be dictated to on the question of diagnosis, but I am of opinion that the practitioner should be required to notify as "suspect" any case which he believes to be clinically one of pulmonary tuberculosis, even though he has been unable to obtain a positive sputum test.

The last question I have to submit for discussion is one which is of considerable importance to administrative tuberculosis officers: I mean the statistics of tuberculosis. It is impossible to frame any conclusions either as to accommodation, &c., required for an efficient scheme, or as to the success of

the scheme, unless we have reliable statistics of the prevalence of the disease and of the secular changes in prevalence. For the necessary data we have to rely on notification. My contention is that our present system does not give us the data we require. While it is possible to keep accurate records of notifications received, and known cases surviving in a particular area, the same cannot be said of the country as a whole, or even of separate counties.

The first source of error is the possibility of cases recorded as "primary" notifications in a given area, being really "secondary"—i.e., notified at an earlier date in some other area. It must be a common experience with others as with me to learn, after reporting a (presumed) "primary" notification, to find that it has already been notified. During the last month some half dozen instances of so called primary notifications proving to be secondary have come to my knowledge. In the country as a whole I am certain that this error is of no slight magnitude, but at present no machinery has been provided for correction. I cannot accept the suggestion that the error due to the acceptance of all notifications as "primary" compensates for failure to notify. Such comfortable assumption leads to a further assumption that the unknown cases are distributed *quâ* age, sex, &c., in the same manner as the secondary notifications which have been ranked as primary.

The second source of error is intimately bound up with the first, and is due to failure to trace patients after removal. With the present shortage of houses this error is not one of very great magnitude, but we hope that the shortage will be of a very temporary character, and provision must be made to correct this error. During the years 1903-20, 8,647 cases of tuberculosis (definite and suspect) have been reported to me, 2,775 of which have been marked off as "removed"—i.e., not far short of one third. Of the cases removed, 61 have been restored to the Register at later dates. What has happened to the others? I wonder how many have been notified in other areas? If notified, they have probably been accepted as "primary" notifications, as I have received very few applications for information as to notifications within the borough.

Two methods of correcting for errors due to removals have occurred to me. The first is to alter the form of notification certificate and require the notifying practitioner to state that he has made inquiry as to previous notification and that the case has either not been notified before or has been notified in (name of district) and (date of such notification). I am inclined to think that it would be an economy to increase the fee for notification to secure such information. The second method is the adoption of a system of "clearance." My proposal is that at stated intervals—monthly or quarterly—the medical officer of health of every district which is not an administrative county, should forward to the county medical officer of health a list of all cases which have moved and not been traced. A scrutiny of the list received would lead to the identification of a proportion of the cases, and the medical officers of health concerned would be duly advised. The remainder, I suggest, should be compiled in one list and circulated not only within the county but generally. I doubt whether all cases would be traced, but I am certain that the error caused by removal would be reduced to a minimum.

I will conclude by quoting an opinion expressed by the President of the Royal College of Physicians (Sir Humphry Rolleston) [7].

"It is deplorable that hundreds of persons die from tuberculosis without being notified at all, and that many notifications are made in the last stages of the disease . . . the time has now come when it (i.e., notification) should be seriously taken in hand and steps taken to exact a penalty for omission to notify a case."

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I think those words justify me in bringing these rudimentary criticisms of our present system of notification before you.

REFERENCES.

- [1] TURNER, E. B., "Part of the General Practitioner in the Campaign against Tuberculosis," *Trans. VII Ann. Conf. (1919) Nat. Assoc. Prev. Tuberculosis*, p. 98. [2] Annual Report of the M.O.H. and School M.O., County of London, for 1919, Appendix, p. 11. [3] COX, G. LISSANT, "On the Notification of Tuberculosis," *Trans. VII Ann. Conf. (1919) Nat. Assoc. Prev. Tuberculosis*, pp. 38 et seq. [4] CUMMINGS, S. LYLE, "Tuberculosis as a Disease of the Services," *Lancet*, 1922, i, p. 844. [5] WÜRTZEN, C. H., "A Contribution to our Knowledge of the Clinical Course and Duration of Lung Tuberculosis," 1922 (Gyldendal: London and Copenhagen). [6] COX, G. LISSANT, "Notification of Tuberculosis compared with Reported Deaths from this Disease," *Lancet*, 1922, i, p. 1072. [7] ROLLESTON, Sir H. D., "The Role of the Medical Profession in the Prevention of Tuberculosis," *Internat. Journ. of Pub. Health*, 1921, ii, p. 469.

DISCUSSION.

Dr. A. K. CHALMERS (President) said that Dr. Dudfield had made a lucid statement of the present position of the subject. The introduction of notification, although it marked a period, did not necessarily produce any change in administrative methods, and particularly any change in the provision for hospital or sanatorium treatment. The value of notification, therefore, was not to be reckoned from the date on which it had been introduced but rather from the beginning of any steps which might have been taken concurrently to give practical effect to the information which notification brought. The movement of the phthisis death-rate during the past ten or twelve years, that was, since notification had been introduced, had been obscured by the war years, and although reduction during these years had continued, he had not been able to convince himself that the rate of decrease was in any sense accelerated by notification or the other administrative steps contingent upon it. He found, for example, that while the rate in Glasgow had during the decade 1891-1900 been almost 25 per cent. lower than that for the preceding decade, and the rate for 1901-10 still 24 per cent. lower than for 1891-1900; for the decade 1911-20 the rate had only been 14·6 per cent. lower than that of the previous ten years; the total fall from the year of maximum death-rate (1871) being equal to 76 per cent. With regard to the increasing interval between the beginning of symptoms and the date of notification which Dr. Dudfield had found a returning feature of the movement, it was well to emphasize the fact that the stage of the disease at which it came under observation was even more important than the interval between notification and sickness. Moreover, many cases were accepted as tuberculous on insufficient grounds. He instanced a recent local inquiry by Dr. Macgregor and Dr. Wilson as a result of which a considerable proportion (about a fifth) of the patients who had been accepted by several Departments as suffering from pulmonary tubercle, had been deleted after rigorous examination. Generally, he thought that notification could be defended because it enabled more careful scrutiny to be made of the clinical and social problems presented by tuberculosis, and of this Dr. Dudfield's inquiry was itself an illustration.

Dr. J. C. McVAIL said that notification did not play exactly the same part in the administrative control of tuberculosis as in control of the common acute infectious diseases. The relative importance of soil and seed was different. In the acute infections the seed was more important than the soil, and notification was of comparatively little value unless it was both complete and early. In an outbreak of typhus or small-pox it would not be of much use to get intimation of only 50 per cent. of the cases, and only at a late stage of the disease. But in tuberculosis the soil was much more important than the seed and, however incomplete the notification, each intimation was of value as a basis of administrative action, even though not made at the beginning of the attack. It gave opportunity for investigation of domestic and occupational conditions, the health of individual members of the household, and for

considering the problem of prevention in the circumstances of the case. Success in control of tuberculosis would depend to a very appreciable degree on co-operation between the public health service and the practising profession. There might be cases in which in the interests of his patient the doctor would desire to delay official action by the public health authority, but informal intimation of such cases should regularly be made, and to achieve that end, a good understanding between the medical officer and the practitioners was essential. Undoubtedly it was important that notification should systematically be as early as was practicable. The General Medical Council had been engaged on revision of its recommendations for the whole medical curriculum. An outstanding feature of that revision was the importance now to be attached to the permeation of medical education by the principle of prevention, and he (Dr. McVail) had no doubt that the importance of early notification would be instilled into the future medical profession, and would bear fruit in the better control of tuberculosis. He had listened with interest and profit to Dr. Dudfield's admirable paper, but in Scotland notification of tuberculosis was provided for not under Regulations as in England, but directly under the Public Health Acts, and so he was not in a position to discuss the suggestions made by Dr. Dudfield.

Dr. C. BUTTAR said that, as a general practitioner, notification could only be useful for two purposes: (1) The acquisition of statistical and scientific results; (2) the immediate benefit of the patient or of contacts. In the case of tuberculosis, it appeared to be agreed that the latter object was aimed at. But the complications involved in notifying a chronic disease, such as tuberculosis usually was, rendered the benefit doubtful; while surely it ought to be true by this time that the general practitioner was quite capable of, and interested in, providing the best conditions for patients and for contacts. For statistical purposes the fact that the patient might be notified in four or five different areas rendered notification fallacious. Closer co-operation between the general practitioner and the medical officer of health, more especially in regard to those patients who were unable to provide suitable means for their own care and nursing, would result in greater benefit to the community than could be obtained under the present system of notification.

Dr. G. CLARK TROTTER (Medical Officer of Health, Islington) noted with interest several points in Dr. Dudfield's excellent paper which emphasized the difficulties in London. The war had led to so very many changes of address that the tuberculosis registers of the Metropolitan Boroughs required most careful correction. No doubt many cases considered as fresh notifications had been previously notified elsewhere. A "clearing house" was required. A person dead could not be legally notified; such a case should be classified as "one coming to the knowledge of the medical officer of health," and added for statistical purposes. His clinical experience also confirmed the two broad classes, (1) those who had died within about two years or so, and, (2) the chronic cases, patients who lived many years with ups and downs, becoming ill during winter, and rallying again. Early notification and intimation of change of address would receive better attention when there was something advantageous to offer; at present the "after-care" was not as efficient as it might be in many boroughs, as there were not sufficient funds for the purpose.

Dr. DUDFIELD (in reply) thought that the conditions produced by the late war fully accounted for the apparently small diminution in the prevalence of and mortality from tuberculosis since 1918. Moreover, as had been said, much more was required to obtain a continued reduction after a certain limit had been achieved—some slackening in the rate of reduction was inevitable. There was unhappily a distinct reluctance prevalent among certain practitioners to "label" their patients as tuberculous. Having regard to the attitude of the public in the past, he sympathized with those practitioners, but he would point out that delay in notification debarred the poorer patients at least from taking advantage of the benefits afforded by the Tuberculosis Scheme. Dr. Buttar wanted to know why he should notify cases in well-to-do patients for whom the very best forms of treatment were provided through

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their medical attendants. The reply to that question appeared to the speaker to be the need of comparative data without which the improvement of the clinical side of the scheme was rendered very difficult if not impossible. He fully agreed with Dr. Trotter's observations on the need of "purging" the registers. He (Dr. Dudfield) urged very strongly the necessity of using card indices and not books. A suitably designed card index not only facilitated "purging" by automatically bringing long standing cases under review, but also kept the register within convenient dimensions for overhauling. In his experience the objection to entering Poor Law infirmaries to which Dr. Trotter had referred, was fast disappearing. The data as to the number of deaths in such institutions quoted in the paper confirmed that opinion.

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The Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Section of Laryngology.

President—Dr. W. JOBSON HORNE.

The 3rd Special Summer Meeting, held June 2-3, 1921.

(I) PAPERS.

- MARK HOVELL, F.R.C.S.Ed.: "Is the Mere Enlargement of a Tonsil good and sufficient reason for its Enucleation?" Published in *Journal of Laryngology and Otology*, October, 1921, p. 437.
- WALTER HOWARTH, F.R.C.S.: "Operations on the Frontal Sinus." Published in *Journal of Laryngology and Otology*, September, 1921, p. 417.
- Sir STCLAIR THOMSON, M.D.: "The Usual Site of Origin of Intrinsic Cancer of the Larynx, as demonstrated at Fifty Laryngo-fissures." Published in *British Medical Journal*, June 25, 1921, p. 921; abstract in *Journal of Laryngology and Otology*, October, 1921, p. 462.
- A. LOGAN TURNER, M.D.: "Paralysis of the Vocal Cords in Cases of Malignant Tumours of the Mamma." Published in *Journal of Laryngology and Otology*, August, 1921, p. 373.
- Sir WILLIAM MILLIGAN, M.D.: "Diathermy in Inoperable Pharyngeal and Epilaryngeal Malignancy; its Objectives and Limitations, with a Review of Cases." Published in *Journal of Laryngology and Otology*, August, 1921, p. 369.
- IRWIN MOORE, M.Ch.: "Eversion of the Sacculus Laryngis, the so-called Prolapse of the Ventricle." To be published in *Journal of Laryngology and Otology*, February, 1922.
- F. HOBDAV, F.R.C.V.S.: "Observations on the Results of over 2,000 Cases of Vocal Cord Paralysis in Horses treated by the Stripping of Morgagni's Ventricle." Published in *Journal of Laryngology and Otology*, September, 1921, p. 422 (under title, "A Plastic Laryngeal Operation for Vocal Cord Paresis in the Horse").
- W. S. SYME, M.D.: "Bronchoscopy in the Treatment of Asthma." Published in *Journal of Laryngology and Otology*, September, 1921, p. 427.

(II) DEMONSTRATIONS.

- R. MORTON, M.D.: "Some Recent Developments in X-ray Treatment for Laryngeal Cases."
- G. T. MULLALLY, M.C.: "The Technique of Blood Transfusion."
- T. B. LAYTON, M.S., D.S.O.: "Demonstrations of some Specimens from the Onodi Collection."

(III) COLLECTION OF SPECIMENS.

A small collection of anatomical and pathological specimens, illustrating some points which had been under discussion during the year, was on view.

Section of Laryngology.

President—Sir WILLIAM MILLIGAN, M.D.

Microscopic Specimens from Three Cases of Bleeding Polypus (Discrete Angioma) of the Nasal Mucous Membrane.

By THOMAS GUTHRIE, F.R.C.S.

Case I.—Woman, aged 32. Obstruction left nostril one year and eight months. Frequent profuse bleeding during last twelve months. Left nostril occupied by growth the size of a small bean, attached by a narrow pedicle to the mucous membrane near its junction with the skin of the vestibule on the outer wall of the nasal entrance and high up in front. Growth removed and base cauterized. No recurrence.

Case II.—Woman, aged 45. Obstruction of left nostril and frequent bleeding for nine months. Growth the size of a large pea attached by a narrow pedicle to anterior end of left inferior turbinal. Removed and base cauterized. No recurrence three months later.

Case III.—Woman, aged 30. Repeated attacks of bleeding from right nostril during past eight or ten months. No obstruction. Growth the size of a large bean attached by a narrow pedicle fairly high up on the inner, that is the septal side, of the right middle turbinal. The growth hung down between the middle turbinal and the septum, and its lower margin reached to the upper border of the inferior turbinal. It resembled both in shape and appearance an ordinary nasal polypus, excepting that it was bright red in colour and with a slightly irregular and granular surface. It bled freely on examination with the probe.

In microscopic appearances the growth, in each of these cases, resembles one or other of the varieties of "bleeding polypus of the septum." Clinically, also, the cases were characteristic of this condition, with the exception of the points of origin of the growths.

A few examples have been described in which these growths originated from the anterior end of the inferior turbinal, as in Case I, but the exhibitor has not been able to find a previous record of a "bleeding polypus" growing from the middle turbinal, as in Case III, nor of one attached, as in Case II, near the muco-cutaneous junction high up on the outer wall of the anterior part of the nasal cavity.

DISCUSSION.

The PRESIDENT thought the third case was most suspicious of sarcoma.

Mr. F. A. ROSE agreed with the diagnosis in the first two specimens, but he was doubtful of the third specimen, which arose from the middle turbinate, and advocated further investigation.

Mr. GUTHRIE replied that the third specimen was of the cavernous angioma type and it had enormous blood spaces.¹ When he removed it he did not cauterize its base, and a month later he had to remove a recurring growth, after which he cauterized the base. The middle turbinal, from which the growth arose, was not infiltrated.

Laryngo-fissure for Early Epithelioma of the Right Vocal Cord.

By E. D. D. DAVIS, F.R.C.S.

PATIENT, a comedian, aged 46, was shown before operation at a meeting of the Section on May 6, and at that time both vocal cords were red and

¹ *Postscript.*—A histological examination of the specimen from Case III by Professor S. G. Shattock, F.R.S., confirms the microscopical diagnosis of a "bleeding polypus of the septum."

[November 4, 1921.]

injected, but there was a small pachydermatous excrescence on the superior surface and edge of the right vocal cord. A piece removed for section was insufficient for diagnosis. A sketch of the vocal cords is exhibited.

Epithelioma was then strongly suspected but doubted by some observers.

Six weeks later the condition of the cord had slightly progressed, so a laryngo-fissure was performed, and the right vocal cord was excised.

The specimen of the growth is shown, and it will be seen that the bulk of the growth is below the vocal cord and was completely out of sight of the indirect laryngoscope. The thyroid ala was not removed. However, five weeks after operation a superficial abscess developed over the right thyroid ala as the result of perichondritis.

Epithelioma of the Left Vocal Cord removed by Thyrotomy nearly a Year ago.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

FEMALE, aged 52, first seen in September, 1920, on account of hoarseness of two years' duration, which had increased during the last six months, and some difficulty in breathing for twelve months; there was tracheal stridor. There was then seen a white "cauliflower" growth on the posterior half of the left vocal cord, this being almost immobile. A portion was removed for examination, and was reported as epithelioma.

I performed thyrotomy on November 11, and removed the growth with tissues wide of it. Her convalescence was disturbed by a severe attack of bronchitis; she made a slow recovery and was removed to the infirmary. She was not seen again until July 5 of the present year, when she presented the appearance of excellent health, but was still retaining her tracheotomy tube. This was removed and has not had to be replaced.

There is still considerable inflammatory swelling of the left half of the larynx, though this has recently subsided to a considerable extent. There is, however, an irregular thickening of the right vocal cord, the nature of which is doubtful.

Two Specimens of Advanced Intrinsic Epithelioma of Larynx obtained by Complete Laryngectomy.

By E. D. D. DAVIS, F.R.C.S.

THE first specimen occurred in a man, aged 64, with urgent dyspnoea. The larynx showed an advanced epithelioma of the left vocal cord, necessitating tracheotomy.

Later, complete laryngectomy was performed, the patient made an uninterrupted recovery, and is present at the meeting.

The second specimen was obtained from a similar case, but this patient died of mediastinitis three days after the laryngectomy. The sepsis is believed to have arisen from the tracheotomy wound made sixteen days before operation. Tracheotomy added considerably to the difficulty in both operations for complete laryngectomy.

DISCUSSION.

THE PRESIDENT said that in Mr. E. D. D. Davis's case of laryngo-fissure, at the anterior commissure there was a small nodule, and he asked Mr. Davis whether it was a recurrence or the result of a stitch, and the reply was that no stitches were used. The sentence, "the thyroid ala was not removed," was very important. It raised the

4 Davis: *Advanced Intrinsic Epithelioma of Larynx*

question whether, in such cases, the ala should be removed or left alone. In the case of Mr. Davis's two specimens of advanced intrinsic epithelioma of larynx, complete laryngectomy was performed for disease confined to the left vocal cord. With regard to sepsis having arisen from the tracheotomy performed sixteen days prior to operation, he asked if the trachea was stitched to the skin of the neck, or was simply a tracheotomy tube inserted? Concerning Sir James Dundas-Grant's case of epithelioma of the left vocal cord, the question was, what was the condition of the right cord? Was it also malignant? He had a male patient whose left vocal cord he removed six years ago, and who had remained well until a few months ago, when the right cord presented a white, tessellated, pachydermatous appearance, with a little œdema, almost identical with that seen in this case, and it was difficult to decide whether it was early malignancy or pachydermia; also as to whether it was advisable to remove the second cord. If malignant he would have some diffidence in removing it from a man aged 70, as in many cases the disease advanced very slowly.

Dr. W. HILL commented on the extreme rarity of primary endo-laryngeal epithelioma in females; he had never seen a case in his own practice.

Sir STCLAIR THOMSON congratulated Mr. Davis on his satisfactory result, and on having left a roomy glottis. When a good projecting portion of growth could not be removed for microscopic examination, it was better to wait and watch the case, forming the diagnosis on the clinical development. The difficulty of viewing the subglottic area by the indirect method would not have been obviated by the direct method, and he considered a better view was obtained by the former method—by working the mirror sideways. He regretted he had not commenced to remove the thyroid ala earlier in his career. He first did so during laryngo-fissure in 1907, because it was involved by the disease. Patient had a good voice and lived for many years. He commenced to remove it systematically in 1917, and in the subsequent five years he had done so in fifteen cases. Fourteen of these were still alive and free from recurrence. One case had recurrence: a partial laryngectomy was performed and patient was now well. In two out of his fifty cases there was a little stenosis and stridor on hurrying or going upstairs; in these two the thyroid ala was not removed. He recommended removal of the ala because it gave more space for the removal of the growth, and it was easier to deal with subglottic extension. It also left the larynx with a fleshy inner surface, and hence quicker healing. In one case—a male, aged 70—following laryngo-fissure a mass like a cherry developed in the anterior commissure, and was found to be an enchondroma! This case, operated upon in 1916, was still well, and free from recurrence. He had operated upon patients of 70 and 75, and they were well five years afterwards. He thought there was a little stenosis in Sir James Dundas-Grant's case which might have been avoided if the ala had been removed.

Mr. F. A. ROSE said he had removed the thyroid ala ever since Dr. Lack recommended it, and he saw no disadvantage in doing so. His experience had been favourable. Generally speaking he was opposed to removing a piece of growth for diagnosis. He advised it should be determined by clinical observation.

Dr. W. S. SYME disagreed with Sir StClair Thomson's faint praise of the direct method: he used it extensively, and in most cases found it gave a better view than the indirect. In such a case as that now being discussed, he did not doubt that suspension laryngoscopy would give a complete view even of the anterior part of the subglottic portion. In 100 cases of suspension laryngoscopy, he had failed in only two to obtain a satisfactory view. He did not like to hear the removal of a piece for examination condemned. Twice he had opened the larynx for what was regarded as malignant growth, but which proved to be tubercular.

Dr. JOBSON HORNE agreed with Mr. Rose as to the unreliability of diagnosis by endo-laryngeal removal of a piece of growth. Laryngoscopic examination should be cultivated, in association with other clinical evidence.

Mr. WRIGHT said that two years ago he saw a man, aged 60, with a pedunculated growth on his right vocal cord. It looked innocent and he removed it endo-laryngeally, and it was microscopically reported to be a fibroma. Recently a larger pedunculated growth had recurred, and he favoured removal by thyro-fissure, but after consultation with colleagues he again removed it endo-laryngeally, and it proved to be an epithelioma.

Dr. IRWIN MOORE referred to the advantage of being able to examine the under surface of the vocal cords in cases of malignant growth, and said he would show at a later meeting an endo-laryngeal mirror which he had designed on the principle of Michels' post-nasal mirror. It could be passed down an endoscopic tube and the subglottic area viewed.

Mr. TILLEY, referring to the President's patient, aged 70, and the treatment of recurrence, advised the new X-ray treatment as advocated by Dr. Morton, directed in equal amounts on all parts of the growth. Dr. Morton applied the rays to a patient on whom he (Mr. Tilley) operated a year previously for extensive malignant growth of the larynx which had recurred, and it was a question whether to perform a complete laryngectomy or a palliative tracheotomy. There was distressing stridor and a little suppurating wound in the operation scar in the neck. Three months after this X-ray treatment the man appeared without any laryngeal trouble: he breathed freely and the skin on the front of his neck was soft and supple. He recently subjected another patient, aged 71, with a growth below the anterior commissure, to the same treatment. It was too early to make a definite report, but the growth was smaller and the voice much clearer.

Mr. E. D. D. DAVIS (in reply) said that in the case of laryngo-fissure for early epithelioma the granulation tissue in the larynx was much smaller, and there was no sign of recurrence. The thyroid ala was not removed because there was no apparent necessity to remove it, but in view of the perichondritis which followed he regretted that he had not done so. This case presented in the early stages a very small ulcer on the cord, and the fragment removed was insufficient for diagnosis, but six weeks later, when the growth had slightly increased, another fragment taken for section was reported to be epithelioma. The advisability of removing pieces of growth for section should be decided in each individual case, and if sufficient tissue could be obtained this should be done in doubtful cases. He had a case having all the appearances of an epithelioma with laryngeal obstruction, but it was difficult to obtain a fragment for diagnosis. Laryngo-fissure was performed four years ago, and the growth was microscopically proved to be tuberculous. Patient did well and was still alive. In the first case of complete laryngectomy, patient was admitted for stridor and laryngeal obstruction. A large cauliflower-like growth was seen arising from the left vocal cord, and it filled the larynx. Laryngo-fissure was performed to ascertain the extent of the growth which was seen to surround the larynx, and a large epithelomatous ulcer occupied the subglottic region on the right. In both laryngectomy cases the trachea was very adherent to surrounding structures in the region of the tracheotomy wounds, and considerable difficulty was experienced in separating the trachea from the œsophagus. He divided the trachea through the lower edge of the tracheotomy opening, and sloped the incision upwards and backwards. The trachea was then firmly sutured to the skin. In the second case the tracheotomy wound was not quite healed, and he thought this source of sepsis accounted for the subsequent mediastinitis. Dr. Morton had treated for him by X-rays a case of recurrence after laryngo-fissure without success. A second case of recurrence of epithelioma in the glands of the neck was similarly treated, and the reaction was so severe that patient refused further treatment and died four months later.

Sir JAMES DUNDAS-GRANT (in reply) said he would have liked more opinions as to the condition of the remaining cord; the thickening had not extended. In answer to Dr. Hill, only three of his laryngo-fissure cases had been females, and all recovered. In one there had been recurrent fibromata for a number of years, and the ultimate epithelioma seemed to be a case of conversion of simple into malignant growth. It was often necessary to remove a piece of growth for examination, particularly in cases of doubt between epithelioma and tubercle.

The PRESIDENT said no one need feel ashamed if he made an error of diagnosis between malignant disease and tuberculous growth of the larynx. He instanced a case in which Sir Felix Semon and Sir Henry Butlin, after splitting the thyroid cartilage, agreed that the case was one of inoperable carcinoma. Someone suggested iodide of potassium treatment, and nine months later patient presented himself to Sir Felix Semon cured.

Model showing the Mode in which the Sacculus Ventriculi Laryngis might be everted by the Negative Pressure caused by Coughing.

By S. G. SHATTOCK, F.R.C.S., F.R.S.

LARYNGOLOGISTS must recognize, with anatomists, a laryngeal ventricle and a sacculus. The sacculus has a well-defined oval mouth limited to the anterior part of the roof of the ventricle; it is distinguished again by the layer of mucous glands in connexion with its exterior. The researches of Dr. Irwin Moore show that there are but three *authenticated* examples of eversion of the sacculus. In one of these (Uckermann's case) the everted structure, which projected from between the ventricular band and vocal cord, was cut away during life; and the abundance of glands with which it was furnished proved that it could have been nothing other than the sacculus. Of the remaining two, one is Sir Morell Mackenzie's, now in the museum at Golden Square; the other, Moxon's, is in that of Guy's Hospital. Mackenzie had cut a window in the thyroid ala on the side on which the eversion was most pronounced (for it was bilateral), and demonstrated the absence of a sacculus from the normal position. Of Moxon's specimen, through the courtesy of Mr. Davies-Colley, Dr. Irwin Moore and I were able to make a further examination: on cutting a window from the thyroid ala no sacculus was found in the proper situation, and the projecting structure could be readily returned into position by means of a probe, becoming reverted in the process. These two cases have, for the most part, been either ignored or discredited by Continental and American authors, or explained away as examples of the more common condition named "prolapse of the ventricle," which apparently consists in a protrusion of the floor of the ventricle into the air-way, as a result of inflammatory oedema or chronic thickening; and it is to the credit of Dr. Irwin Moore that he is reinstating Mackenzie's and Moxon's observations to their right position in laryngological literature.

It is not easy to see, at first, how eversion can be brought about. The view which I venture to submit is that it results from the *negative pressure* set up by violent coughing. The effective closure of the glottis which precedes coughing, takes place at the site of the true cords; any approximation of the ventricular bands can be only a concomitant, seeing that the latter are unprovided with muscle. When the glottis is suddenly opened in coughing, the blast of liberated air rushes by the ventricle and orifice of the sacculus; and if often repeated the negative pressure so induced may lead, first to some degree of loosening of the attachments of the sacculus, and then to its complete eversion. There may be another factor. The need of occasionally "clearing the throat" whilst speaking is possibly due to the descent of mucus from the sacculus and its engagement in the glottis, which impairs the proper vibration of the cords; a slight expiratory effort dislodges the secretion and restores the voice. The act of forcible coughing might thus, should an unusual amount of stringy mucus project from the sacculus, be followed by a drag which would tend to empty the latter and loosen its connexions.

The little model which I exhibit is constructed of a length of rubber tubing of the size of the trachea; near the top an oval slit has been cut horizontally into its side, and over this is fixed a short piece of the blind end of a thin rubber finger-cot. Each time the tube is blown through the cot collapses, being drawn inwards by the *negative pressure* so produced. If the distal end

of the tube is closed, so as to make the pressure *positive*, the cot is distended so as to rupture, or is blown away from the oval rim over which it is fixed.

DISCUSSION.

Dr. JOBSON HORNE said when laryngologists referred to the ventricle they included the sacculus, "the greater includes the less," and by "prolapse of the ventricle" they obviously meant prolapse of the sacculus.¹ It was common knowledge that the ventricle could not prolapse. A section through the larynx showed that the walls of the ventricle were so tightly attached that their prolapse or eversion was physically impossible. It was only the sacculus which prolapsed.

Sir JAMES DUNDAS-GRANT believed that the ventricular bands did come together, and he had observed this in an elderly woman told to "bear down" when the larynx was examined. Dr. Smurthwaite also had observed this in "vicarious" action of the ventricular bands in soldiers who had nerve troubles, and apparent inaction of the adductors of the vocal cords. He suggested certain muscular fibres which came into action to bring this about, probably in the thyro-ary-epiglottic muscles.

Professor SHATTOCK (in reply to Dr. Jobson Horne) said the distinction between the ventricle and the sacculus was one recognized by anatomists. On the argument that the ventricle included the sacculus, as the greater included the less, the vermiform appendix might find itself without a name, since it could be viewed as part of the cæcum. To Sir James Dundas-Grant he replied that the approximation of the ventricular bands so hid the parts beneath that nothing could be inferred as to the rôle the cords played in the closure of the glottis.

Postscript.—The following note upon the closure of the glottis has been kindly furnished to me by my colleague, Mr. W. G. Howarth: "If the larynx is examined by the direct method, it will be seen that when coughing or any other spasm occurs, the ventricular bands close over the true cords so as to conceal the latter from view. If, however, the bands are pressed upon with a probe, they can be readily displaced; the vocal cords are then disclosed in firm apposition."—S. G. S.

Accessory Thyroid growing in the Œsophageal Lumen.

By H. LAWSON WHALE, F.R.C.S.

FEMALE, aged 58, seen September, 1921, with history of an impacted fish-bone in the gullet. Examination with Brünings' tube revealed no bone, but a swelling on the dorsal aspect of the lumen, at the level of the second dorsal intervertebral disc. The excrescence was moriform, attached by a broad pedicle, roughly spherical, and size of a small cherry. Tumour was easily removed with Irwin Moore's forceps and Mosher's tube.

Dr. Sanguinetti pronounced the tissue to be purely thyroid. Professor Shattock confirms this and remarks that "although such aberrant formations have been encountered higher up in the pharynx, their occurrence in the œsophagus does not appear to have been as yet recorded."

A microscopic section was exhibited.

Paralysis of the Left Recurrent Laryngeal Nerve due to Pressure of Mediastinal Glands.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

FEMALE, aged 49, first seen September 20 with hoarseness of two years' duration following influenza. The left vocal cord found fixed in the cadaveric

¹ F. H. Bosworth, "A Treatise on Diseases of the Nose and Throat," 1892, ii, p. 43.

8 Dundas-Grant: *Former Paralysis of Left Recurrent Nerve*

position; no tracheal tugging. X-rays showed old fibrosis of both apices, many mediastinal glands, but no evidence of thoracic aneurysm.

The PRESIDENT showed an illustration of a similar condition, in which paralysis of the left recurrent nerve was due to the pressure of mediastinal glands.

Former Paralysis of Left Recurrent Nerve; Tracheal Tugging; Suspected Aneurysm.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

MALE, aged 43, first seen January, 1921, on account of hoarseness. The left vocal cord was fixed in the cadaveric position. X-rays in October, 1919, showed "general enlargement of aortic shadow; some encroachment into the posterior mediastinum. Pulsation. No positive sacculation. ? Either general dilatation or aneurysm involving whole of thoracic arch." Wassermann positive.

On January 11, 1921, the left vocal cord was in cadaveric position. October 1, the vocal cords moved normally; some amount of tracheal tugging. Patient has been continuously taking iodide of potassium.

DISCUSSION.

Dr. W. HILL said there could be no doubt about the aneurysm, which was of considerable size.

Dr. DAN MCKENZIE referred to a similar case seen in association with Dr. F. G. Crookshank, in which the vocal cord paralysis cleared up and the shadow of the enlarged mediastinal glands disappeared after antisyphilitic treatment.

Dr. P. WATSON-WILLIAMS pointed out the possibility of temporary paralysis in aneurysm. He referred to a patient who had sometimes complete paralysis when he took exercise, but when resting only abductor paralysis.

Sir JAMES DUNDAS-GRANT (in reply) remarked that the temporary paralysis might be due to a perineuritis, or to an inflammatory condition, not purely to pressure of the aneurysm. Discussions on paralysis of the vocal cord in mitral stenosis in a number of cases suggested a perineuritis of the nerve. He would report on the case later.

"Combined Electroscope and Endoscopic Tubes, with Interchangeable Proximal and Distal Light for Direct Laryngo-tracheo-bronchoscopy and Oesophagoscopy." Designed by IRWIN MOORE, M.Ch.

"An Improved Rasp, with Curved Cutting Edges, for the Intranasal Frontal Sinus Operation." Shown by P. WATSON-WILLIAMS, M.D.

THE following cases or exhibits have been referred, along with the discussion, for later publication, until further investigations or completed reports have been submitted:—

- (1) G. W. DAWSON, F.R.C.S.I.: "Angelioma (?) of the Larynx."
- (2) H. BUCKLAND JONES, M.B.: "Case of Bilateral Abductor Paralysis."
- (3) M. VLASTO, F.R.C.S.: "Foreign Body in Oesophagus."
- (4) G. W. DAWSON, F.R.C.S.I.: "Case for Diagnosis; ? Epithelioma."
- (5) W. H. JEWELL, O.B.E.: "Malignant Disease of Left Maxillary Antrum involving Orbit and Hard Palate."
- (6) W. H. JEWELL, O.B.E.: "Tumour of Larynx; ? Malignant."
- (7) Sir JAMES DUNDAS-GRANT, K.B.E.: "Case of Unilateral Epithelioma of Throat and Cheek in an Excessive Pipe Smoker."

Section of Laryngology.

President—Sir WILLIAM MILLIGAN, M.D.

Epidiascopic Demonstration of Photographs illustrating the Repair of Nasal Deformity caused by Syphilis.

By DOUGLAS GUTHRIE, M.D.

M. C., AGED 18. Between the ages of 9 and 16 this girl suffered from inherited syphilis, which destroyed the cartilaginous part of the septum and the columnella and caused an extreme degree of saddle-nose deformity. After three months of antisiphilitic treatment Wassermann reaction became negative, and operation was undertaken. The nasal bridge was reconstructed by a costal cartilage graft and a columnella was fashioned from an upper flap from the skin of the vestibule and two lower flaps from the upper lip.

I have operated upon seven such cases: two of them due to syphilis, five caused by injury. The traumatic cases are naturally the more favourable, but in all the results were good.

DISCUSSION.

The PRESIDENT praised the results in these cases, especially in the one described. Dr. Guthrie said it did not matter whether the perichondrium was included in the graft or not. In the cases he (the President) had operated upon, he used a graft from the fibula and included the perichondrium. With such success possible, he thought this operation should be carried out in more cases.

Mr. WOODMAN emphasized Dr. Guthrie's point as to the submucous incision being carried to the tip of the nose, because in a recent case, that of a small girl, he only carried it to within $\frac{1}{2}$ in. of the tip, and a gap was left there. A month later, as a result of a blow, the end of the nose became more rounded and much improved in appearance.

Mr. J. F. O'MALLEY also congratulated the exhibitor on his case. In cases in which the deformity was not so great he had grafted from the opposite direction, making an incision into the tip of the nose immediately below the most prominent point. The tissues healed, and no signs of the incision remained.

Mr. F. H. DIGGLE asked whether it had been found necessary to bare the lower part of the frontal bone so as to get the graft to adhere. He had had experience of only one case, which appeared satisfactory, but three months later the graft had been found lying in the naso-labial fold.

Dr. KELSON pointed out that the date of operation was not mentioned in this case. It was important, for he had seen cases which, though satisfactory at the time, showed later a tendency to shrinkage.

Mr. A. A. SMALLEY confirmed Dr. Kelson's experience. He asked whether Dr. Guthrie had been able to keep the graft as steady as he wished. He (the speaker) had found a horsehair strand passed through the nose and tied over the graft anchored it well.

Mr. T. P. KILNER showed (in the absence of Major Gillies) photographs illustrating the results of, and emphasizing the necessity for, skin-grafting the inner aspect of the nose previous to the insertion of the cartilage graft in such a way as to make good that portion of the mucous lining lost or contracted as the result of the disease. He pointed out that many cartilage grafts owed their indifferent cosmetic results to lack of attention to this important point.

Major GILLIES (now present) remarked that in tertiary syphilis of the nose there was much destruction of mucous membrane, and in a large number of syphilitic cases, if only cartilage were implanted the desired result would not be achieved. It was necessary to replace the mucous membrane which had been destroyed, as well as the bone or cartilage which had gone. Cartilage did well with supporting structures; but in order to supplant the mucous membrane and get a firm nose, there must be implanted sufficient skin-graft to allow of the necessary lengthening of the sides of the nose. Then the cartilage would hold in good position. He agreed with what Dr. Guthrie had said about the persistence of cartilage in these specific cases.

Dr. GUTHRIE (in reply) expressed his indebtedness to Major Gillies for much of his knowledge on these matters. In answer to Dr. Kelson, the date in the case demonstrated was June 10 last. At the meeting of this Section in June, 1920, he exhibited three cases treated by this method, and had recently seen them and none had altered. There was no need for any contrivance for steadying the graft. It was advisable to make a pocket not only in a downward, but also in an upward direction, and not too deep, accurately adapting the length of the graft to the length of the pocket, so that when the graft was introduced it would be tightly gripped. He did not find it necessary to expose the nasal bones, though in using bone-graft it might be so, for in using bone it had to be implanted on tissue of corresponding nature. The advantage of a cartilage graft was that it was natural tissue, and greatly superior to paraffin or other foreign substances, for it could easily be reduced down to the exact shape and size required, and persisted unaltered in the subcutaneous tissue.

Intrinsic Epithelioma of the Larynx, shown before Operation.

By Sir STCLAIR THOMSON, M.D.

SCHOOLMASTER, aged 53, with progressive hoarseness for one and a half years. No other symptom. The left vocal cord moves freely, but with slight mechanical impairment anteriorly, as the entire cord, except for a trifling portion at the posterior extremity, has been replaced by an infiltrating, knobby, irregular neoplasm. It has a characteristic rough, white, slightly cauliflower appearance, and in the anterior third there is a greyish retracted area (the most prominent part), such as I have noticed in other cases, doubtless similar to the retraction of the nipple in mammary carcinoma. The growth extends close up to the anterior commissure.

The diagnosis in this case is founded entirely on clinical conditions. The cord is not fixed and the condition is unsuitable for a preliminary removal of a portion for microscopic examination, besides being unnecessary. The Wassermann reaction is negative.

DISCUSSION.

The PRESIDENT agreed that the growth was malignant and confirmed the value of diagnosis based upon clinical appearance.

Dr. JOBSON HORNE said he did not question the diagnosis, but the statement that the cord moved freely. An infiltration which had gone far enough to extend deeply into the intrinsic muscles of the cord was against free movement. He considered that there was certainly a myopathic impairment of movement of the cord.

Mr. SEWELL and Dr. SMURTHWAITE supported Dr. Jobson Horne's contention.

Sir STCLAIR THOMSON, in reply, accepted the criticism as to movement of the cord and withdrew the adverb "freely." He considered that much of its defective movement was due to the bulge of the neoplasm coming up against the other cord. Besides a thickened cord always appeared to flag more than one which was thin.

Postscript.—Laryngo-fissure was carried out next morning and, after removing the right thyroid cartilage, the growth was removed *en masse* with a free margin in all directions. Microscopical examination disclosed an undoubted squamous epithelioma reaching down to the small muscles, but showed that the growth had been completely removed in all directions; consequently the prognosis should be good.

Case of Sarcoma of the Cheek and Maxilla, with Diffuse Secondary Growths.

By E. D. D. DAVIS, F.R.C.S.

MALE, aged 39, seen September, 1920, with a soft tumour of two months' duration, situated in the incisive fossa of the right maxilla, bulging out the upper lip and right nasolabial fold. The outer wall of the right nasal cavity was slightly pushed inwards, the right antrum was opaque, and the X-rays showed opacity of the right maxilla with involvement of bone. A similar but smaller swelling surrounded the alveolus in the position of the right upper wisdom tooth. Wassermann reaction negative.

The tumour of the incisive fossa was excised and found to invade the antrum, and microscopically was stated to be sarcoma.

October 14, 1920: The right maxilla was completely excised; no local recurrence, but two months later patient complained of pain and weakness of the left hand, followed by complete paralysis of the arm as a result of involvement of the brachial plexus. A fullness of the left supraclavicular region with enlargement of the left cervical glands was observed; later an enlargement of the right cervical glands, and secondary deposits along the left ribs and on the penis. A secondary deposit in a lymphatic gland lying on the rib was removed and microscopically stated to be sarcoma. Blood examination normal.

Patient has been treated by radium at the Radium Institute, and all secondary growths have apparently disappeared.

DISCUSSION.

The PRESIDENT asked whether radium was introduced into each secondary growth, otherwise it seemed remarkable for it to exert such a centrifugal action on a number of secondary growths. Were all the secondary growths malignant, or were some only inflammatory?

Mr. W. M. MOLLISON said, in his experience, secondary growths were of great rarity in such cases. He had seen cases from two to seven years after operation, but never one with such secondary deposits.

Mr. NORMAN PATTERSON referred to one case of this nature in which enormous glandular secondary deposits appeared $4\frac{1}{2}$ years afterwards, and then in the neck.

Mr. MUSGRAVE WOODMAN remarked that unless the growth affected the alveolar margin secondary glands in a case of sarcoma were very rare. He had not dissected

12 Davis: *Tumour of Malar Recess and Floor of Orbit*

out neck glands, but had tied the carotid artery. In one case diagnosed as endothelioma of the left side of the nostril the patient developed a pre-auricular parotid gland on the opposite side of the face.

Dr. SMURTHWAITE had seen two cases in males of spheroidal-celled carcinoma of the sphenoid which showed an absence of enlarged glands in the neck. One died of cavernous sinus thrombosis, the other, following radium treatment, was still alive.

The PRESIDENT referred to three similar cases which he had now under treatment and examination revealed no enlarged glands.

Mr. VLASTO (replying for Mr. Davis) considered that the diagnosis was confirmed microscopically. Only one of the secondary growths had been examined and shown to be typical sarcoma.

Tumour of the Malar Recess and Floor of the Orbit.

By E. D. D. DAVIS, F.R.C.S.

A WOMAN, aged 39, complained of a swelling below the outer corner of the left eye of nine months' duration. The left eye was pushed upwards and forwards, and there was distinct prominence of the malar. No pain, no nasal or glandular symptoms. Nose normal. Left antrum opaque. X-ray: Opacity of left malar region.

On June 2, 1921, the cheek was reflected by a Ferguson incision, carried across the lower eyelid immediately external to the punctum lachrymale. The lower eyelid and cheek were reflected outwards to expose thoroughly the malar and its zygomatic process. A soft vascular growth with the appearance of a carcinoma was found occupying the floor and outer angle of the orbit, and to have eroded the malar bone. The growth arose from the floor of the orbit, was considered to be malignant, and consequently was freely excised. However, the section, which is shown, was stated by the pathologist, Dr. Topley, to be chronic inflammatory tissue with giant cells, and was labelled "Tuberculosis."

Attention is drawn to the scar resulting from division of the lower eyelid, which is hardly noticeable and can be compared with the preceding case.

Foreign Body (Piece of Wire) removed from Right Arytæmoid Cartilage by Indirect Method.

By ANDREW WYLIE, M.D.

FEMALE, aged 57, when eating beans "swallowed a needle." This was followed by acute pain for two days. A small, dark object was seen protruding from the right arytæmoid towards the inner surface. With Mackenzie's forceps by indirect method a piece of wire 1 in. long was removed. It was difficult to get hold of since it became buried in the tissue as soon as the forceps touched it.

DISCUSSION.

The PRESIDENT and Dr. DONELAN congratulated Mr. Wylie on his success in such a delicate procedure.

Dr. P. WATSON-WILLIAMS recommended for such cases forceps one blade of which was steady, the other closing down upon it, as in the laryngeal forceps he had introduced many years ago.

Case of (?) Arrest of Development of the Trachea.

By C. A. SCOTT RIDOUT, M.S.

BOY, aged 16. First seen on September 27, 1921, suffering from extreme dyspnoea with marked recession, livid, gasping. General enlargement of thyroid, especially right lobe.

History: Difficult breathing on exertion noticed after enteric fever eleven years ago, also a "lame right hip." Unable to move about quickly owing to dyspnoea, but could talk quite well. Pneumonia twelve months ago. Breathing much worse afterwards, "swelling of neck" noticed two weeks before admission on September 27.

As no anaesthetic was possible, injection of cocaine and adrenalin used and incision made for low tracheotomy. Right lobe of thyroid found in middle line of neck—on pushing aside and dissecting carefully a cord-like collapsed trachea was exposed deeply placed, about the size of a goose quill, flattened laterally, and pushed to left of middle line; incision carefully made after injection of 1 per cent. cocaine; with difficulty No. 28 Parker's tube inserted; immediate relief. Tube later on coughed out, grave symptoms returned, larger tube inserted. After fourteen days attempt made to leave out tube without success, and after nineteen days also. By this time thyroid was rapidly disappearing after 5 gr. thyroid extract daily. Tube replaced October 18, 1921, owing to recurrence of dyspnoea, and on October 19, 1921, fresh incision made over cricoid cartilage, which is almost normal in size, the trachea being atrophic up to this point, and Koenig's tube inserted; fresh modification of tube subsequently with larger lower opening and extra opening at angle of tube to permit of phonation. Thyroid is now not to be felt. Larynx, except for somewhat infantile appearance of epiglottis, is not unduly small for his age. Chest: Heart and lungs not abnormal. Right thigh: All muscles wasted, movements all present; reflexes apparently normal. Measurements: Right thigh, from anterior superior iliac spine to lower margin of inner condyle of femur, 18½ in.; left thigh, 19½ in.; right tibia, 15 in.; left tibia, 14¾ in.

Opinions are invited as to cause, prognosis and future treatment of tracheal condition.

DISCUSSION.

The PRESIDENT wondered whether it was a congenital condition, or whether it resulted from the attack of typhoid fever at 5 years of age. He asked whether an endoscopic examination had been made, and if so what was the condition at the bifurcation of the trachea and upper part of the bronchial tree. Cases had been recorded in which the trachea was very small, with a marked malformation of the bronchial tree; also those in which practically no trachea existed, as in anencephalous monsters. Again there were cases in which only a part of the trachea had developed as recorded by Meckel. Morell Mackenzie reviewed the subject in his text-book. The question was whether anything could be done for this boy or must he be condemned to wear a tube all his life? He could not give an opinion until he knew what was the condition in the upper region of the bronchial tree.

Dr. W. HILL remarked that the cricoid was said to be normal, which one would not expect if the condition were congenital. The vestibule of the larynx was small, but not infantile. The growth of the trachea appeared to have stopped, or to have much slowed down, at the fifth year, when typhoid occurred. The lumen was of normal shape and unlike that of a compressed trachea.

Sir JAMES DUNDAS-GRANT said the history did not support its congenital origin, as it dated only from the typhoid fever, following which he thought it likely that some atrophy of cartilage had occurred and accounted for apparent persistence after the

pressure of the right lobe had been removed. X-rays might indicate the condition of the lower part of the trachea. And if this proved to be wide, possibly the constricted portion might be resected as in cases recorded by Glück and others.

Mr. J. F. O'MALLEY suggested that the recent dyspnoea was due to pressure of the enlarged right thyroid lobe. The size of the trachea in a child, five years of age, varied between 8 and 10 mm., hence this trachea did not appear to have grown since that age. If congenital it was interesting to find the laryngeal cartilages well developed. He thought typhoid fever had some connexion with the arrest. An involvement of the perichondrium might have caused the trouble.

Dr. P. WATSON-WILLIAMS agreed that the history suggested the attack of typhoid fever as the cause. In some cases of typhoid fever there was definite ulceration of the larynx (he had published one case) and it was possible that in this case the ulceration had involved the trachea with subsequent cicatrization.

Dr. JOBSON HORNE referred to several specimens he had seen in museums, in which a similar constriction of the trachea was caused by pressure of the enlarged thyroid. With such an obvious cause he thought there was no need to attribute it to typhoid fever. The Laryngological Society of London discussed this subject about 1896.

The PRESIDENT did not think that typhoid fever could cause such uniform stenosis, and suggested that probably the whole bronchial tree would be found to be in a similar condition, and that the typhoid probably aggravated the stenosed condition already existing, i.e., the lad got on well until the typhoid added to the trouble. Compression of the trachea by the thyroid occurred, but in the present case the stenosis was not local.

Dr. DONELAN inquired whether the atrophy of thigh muscles dated also from the typhoid fever.

Mr. RIDOUT (in reply) said the atrophy of the thigh muscles started with the typhoid fever. At first he thought it was a case of thyroid pressure; the cartilage was atrophic, giving the impression of a collapsed rubber tube. He believed the whole trachea was in the same condition, from the episternal notch to the cricoid. He would ascertain by bronchoscopy the condition of the bronchial tree. There had been arthritis in the leg, and the head and neck of the femur were small in comparison with the opposite side. Still the boy walked well.

Case for Diagnosis.

By GEORGE W. BADGEROW, C.M.G., F.R.C.S.Ed.

MALE, aged 33, complains of hoarseness for the last twelve months. The whole of the right cord is affected by a growth resembling a papilloma. The cord moves freely.



FIG. 1.—On quiet respiration.



FIG. 2.—On phonation.

DISCUSSION.

The PRESIDENT regarded the case as malignant.

Dr. P. WATSON-WILLIAMS considered the snow-white hue was strongly in favour of the growth being malignant. It had rapidly increased in size, and seemed to have grown more from the surface rather than deeply. He advocated removal of a good piece for examination, if the patient was willing to undergo laryngo-fissure should it prove to be malignant.

Dr. DONELAN said the case reminded him of one shown by the late Sir Felix Semon, which was now illustrated in Sir StClair Thomson's book. He (the speaker) regarded this as a slowly-progressing malignant condition.

Sir STCLAIR THOMSON said this was a suitable case for a piece to be removed for preliminary examination. He had had two apparently similar cases, at first thought to be papilloma, chiefly because of the absence of all infiltration. As a routine, he sent the tissue to the pathologist, who reported it malignant. The tissue derived from the operation showed no malignant cells, indicating that the whole growth had been got away with the preliminary removal through the mouth. This fortunate result was not quoted to support an idea of ever attempting complete removal through the mouth, but to show that in cases—similar to the present—a mass could be removed amply sufficient to demonstrate cancer, if it existed.

Dr. ANDREW WYLIE said he showed a similar case before the old Laryngological Society, and there was a discussion as to whether it was a malignant growth or a simple papilloma. He removed several pieces, and different pathologists regarded the condition as papilloma, but the patient later developed epithelioma and died.

Sir JAMES DUNDAS-GRANT referred to a case exhibited by Dr. William Hill, almost identical with this, of slow progress, and considered to be keratosis of the larynx, and non-malignant. Eventually, clinical features of malignancy developed, and death ensued. As the specimen went astray the pathological confirmation was not obtainable. He considered the present case similar, but likely to become malignant.

Dr. JOBSON HORNE did not hesitate to declare that this case was not malignant, though that was a relative term. There was very free movement of the cords in spite of the mass of growth. With regard to removing a portion for examination, that would not be conclusive unless a portion of the cord were included in the specimen. Though innocent now, he thought that if it were irritated it might become malignant.

Mr. O'MALLEY agreed as to the free cord movement and the absence of infiltration in that situation, but the arytenoid on that side seemed to him to be involved.

The PRESIDENT did not doubt that the case was clinically malignant. There seemed to be much efflorescence of an inflammatory nature, but he thought the base would prove to be malignant. He would not remove a piece for microscopical examination, but would proceed to operate straight away by laryngo-fissure.

Mr. BADGEROW (in reply) said though he regarded the growth as malignant, doubt was not absent from his mind. He thought the right course was to do laryngo-fissure, then have the specimen examined by an expert.

Case of Laryngeal Web.

By W. H. KELSON, M.D.

PATIENT, a male, aged 56. Laryngo-fissure was performed on July 14, 1921, for carcinoma of the left vocal cord, involving anterior commissure. Very rapid convalescence, followed by formation of web, preventing adduction of vocal cords, and returning after removal. Opinions are invited as to prevention of such adhesions.

DISCUSSION.

Sir JAMES DUNDAS-GRANT advised mechanical treatment.

The PRESIDENT said the web was not adherent in front, and there was a small space behind. The middle third of the cords were agglutinated. He once showed to the Section an apparatus he used in a case after dividing such a web, in order to keep the raw surfaces from re-uniting. He suggested its employment in this case.

Dr. KELSON accepted the President's suggestion. He had not found recorded any treatment likely to prevent such adhesion.

THE following cases or exhibits have been referred, along with the discussion, for later publication, until further investigations or completed reports have been submitted:—

- (1) G. W. DAWSON, F.R.C.S.I.: "Antro-Choanal Polypus of Unusual Size."
- (2) ANDREW WYLIE, M.D.: "Fibroma of the Right Vocal Cord: removed."
(Growth shown.)
- (3) ARTHUR J. HUTCHISON, M.B.: "Section of Papilloma from the Left Vocal Cord."
- (4) Sir JAMES DUNDAS-GRANT, K.B.E., M.D.: "Functional Ventricular Band Phonation suggesting Tuberculous Laryngitis."
- (5) Sir JAMES DUNDAS-GRANT, K.B.E., M.D.: "Persistent Functional Falsetto (Eunuchoid) Voice suggesting Tuberculosis of the Larynx."
- (6) E. A. PETERS, F.R.C.S.: "'Solitary' Papilloma of the Larynx."
- (7) ANDREW WYLIE, M.D.: "Papilloma of the Larynx."
- (8) F. J. CLEMINSON, M.Ch.: "Tumour of the Left Superior Maxilla."
- (9) W. H. JEWELL, O.B.E., M.D.: "Tumour of the Pharynx."
- (10) Sir JAMES DUNDAS-GRANT, K.B.E., M.D.: "Aural Discomfort relieved by propping out the Collapsed Ala Nasi."
- (11) J. F. O'MALLEY, F.R.C.S.: "Post-nasal Growth."

Section of Laryngology.

President—Sir WILLIAM MILLIGAN, M.D.

Carcinoma of the Œsophagus perforating into the Trachea at the Bifurcation; Report of a Case and Demonstration of Specimen.

By H. V. FORSTER, M.B.

MALE, aged 45. A week previous to being seen by exhibitor (September 16, 1921), whilst taking tea, he had been seized with a violent fit of coughing, followed by pyrexia and signs of pneumonia. He was much wasted and could not take nourishment. He had complained of vague pains in the chest for several months, but there was only a definite history of a week's illness. Water, when taken, was almost immediately coughed up. X-rays, by Mr. R. E. Roberts, revealed complete arrest of food at the ninth dorsal vertebra, and the trachea lined by portions of the barium meal, and the œsophageal appearance typical of malignant stricture.

Patient died within a few days from exhaustion and septic pneumonia. The post-mortem specimen shows a perforation just below the bifurcation of the trachea, caused by malignant disease, originating in the œsophagus.

DISCUSSION.

The PRESIDENT said he had seen cases of this kind, and referred to the case of a lady who had been ill for months and was supposed to be suffering from a neurosis, but on the morning he was consulted she had expectorated a little blood and had complained of her throat, and of some dysphagia. He suspected some organic disease. On examination he found, $1\frac{1}{2}$ in. below the level of the vocal cords, a small fungating, mulberry-shaped, œdematous vascular granulation; and that appearance, with the accompanying symptoms, made him think it was malignant disease of the œsophagus perforating into the trachea. Patient died in five weeks from a severe hæmorrhage from the ulcerating area, and autopsy showed that the growth had extended from the œsophagus into the trachea. Another case, a male, had had paralysis of the left vocal cord for some time, but no definite cause could be assigned. One day, following a sharp attack of coughing, he brought up some blood; next day there was a very violent hæmorrhage, and death occurred a few days after. Autopsy showed a malignant growth, which had ulcerated into the lower end of the trachea. It was important to remember this mode of death in these cases.

Dr. W. HILL spoke of the importance of recognizing the condition from the early symptoms. He advised suspected cases to swallow a little water, and if this was coughed up twenty or thirty seconds after being taken, there should be at least a suspicion that there was a communication between the trachea and œsophagus. Where the œsophagus was involved by malignant growth, or where there was growth in juxtaposition

to the œsophagus, the perforation was nearly always into the left bronchus, rather than into the trachea. In the present case it was near the bifurcation of the trachea. He assumed, therefore, it was in the lower end of the trachea, as observed by screen examination following a bismuth meal. Sometimes the aperture was valvular, and solid food did not always pass through it. It was necessary to eliminate cases in which there was a pharyngeal growth and the overflow was in the air-passages; in those cases the bismuth could be seen passing down the trachea. Was the perforation in this case into the trachea, and not into one of the bronchi? He advised intubation or gastrostomy. Following the insertion of a Symonds's funnel tube, one of his cases lived three months with a small perforation of valvular character.

Sir JAMES DUNDAS-GRANT remarked that in such cases, if regurgitation of fluids occurred, the patient's condition was a very terrible one. Of the few cases he had seen, one had the perforation an inch below the larynx. Michel, of Hamburg, had described a means of dealing with such a case, i.e., by inserting a long tracheotomy tube with an expanding indiarubber cover, which could be distended with air, or better, with glycerine, so as to cover the fistula.

Mr. DOUGLAS HARMER remarked on the capacity of these people to live so long after perforation had occurred. One of his patients coughed water back the moment after he had swallowed it. As observed by X-rays, a thick bismuth meal at once went into both his main and secondary bronchi. He thought no treatment was possible in that case, and did not advise gastrostomy. The patient, however, still went on with his business, did not suffer any pain, and lived over a year.

Mr. FORSTER (in reply) said that in this case a screen examination and a rapid exposure photograph showed that a barium meal passed down the œsophagus and then came to a stop, a portion trickling through a small opening running into the trachea. The skiagram showed the trachea lined by barium. The case favoured Dr. Hill's view that the usual site of perforation was the left bronchus, the perforation being on that side of the bifurcation of the trachea; and at autopsy, septic pneumonia was traced from the left bronchus. Both Dr. Hill and Sir James Dundas-Grant spoke of intubation in these cases; he (Mr. Forster) thought, after he had referred the patient for gastrostomy, that an attempt might have been made to insert a Symonds's tube, but he died before anything could be done. He only saw the case a few days before death. Patient had noticed nothing amiss until a week previously, but had been complaining of pains for six months. On account of the coughing, he (Mr. Forster) thought at first there might be a post-ericoid growth.

Mucocele of the Left Frontal Sinus; Report of a Case and Demonstration by Photographs.

By H. V. FORSTER, M.B.

PATIENT, aged 35, complained of displacement of the left eye, which had existed for eighteen years, and started with acute pain. What was apparently an orbital cellulitis was opened at that time, and pus evacuated. The protrusion of the eyeball increased, and latterly became unbearable and the eye blind. He has been unable to close the eye for a year. Examination showed a tense fluctuating swelling under the left eyebrow, and only a little muco-pus on the anterior end of the middle turbinal. X-rays, by Mr. R. E. Roberts, showed an extensive enlargement of the left frontal sinus, which suggested mucocele.

At the operation, via the Killian route, a large cavity was entered without encountering bone, and a large quantity of translucent brown-stained fluid evacuated. The cavity encroached upon the ethmoid as far as the outer nasal

wall, and had caused absorption of the greater part of the orbital roof, and distortion of the supra-orbital margin. The eyeball was much displaced forwards and downwards, with great stretching of the orbital nerves and muscles. After removal of the thin membranous lining, the cavity was drained into the nose through the ethmoid by removing parts of the fronto-nasal process of the superior maxilla and the lachrymal bone. The eyeball was replaced and the wound closed.

Recovery was uneventful except for two attacks of vertigo.

Mr. Gorst now reports slight vision in the left eye and considerable recovery of function in orbital muscles.

Laryngeal Tumour for Diagnosis.

By LESLIE POWELL, M.B.

E. P., MALE, aged 51.

October, 1919: Complained of husky voice of ten months' duration after getting wet. On examination: Pedunculated mulberry tumour attached to posterior third left vocal cord.

November, 1919: Piece removed; report—papilloma.

December, 1919: Several similar small tumours seen behind and below original one.

January, 1920: Laryngo-fissure; all growths removed.

March, 1920: Broad-based prominence attached to left arytaenoid and obscuring part of left cord. Wassermann reaction negative.

May, 1921: Dyspnoea in mornings.

November, 1921: Dyspnoea marked, necessitating admission to hospital for a few days.

No symptoms now except slight huskiness, and no change in appearance.

Opinions are invited as to treatment.

DISCUSSION.

The PRESIDENT said it was very difficult to arrive at a conclusion in such a case. The local appearances suggested some perichondrial trouble under the swelling on the left side and in the posterior part of the larynx. It looked tuberculous, but, from the history, it appeared not to be so. The perichondritis might however have resulted from the operations.

Mr. TILLEY was impressed with the patient's story of having been getting progressively weaker and easily tired on moderate exertion; this aroused the suspicion of tubercle. No tubercle bacilli having been found in his sputum, he suggested full doses of iodide of potassium and a further examination for the bacilli in four or five days; this method sometimes revealed the organism in the increased secretion. In the present case there might be an old quiescent tuberculous lesion in the lung.

Dr. W. HILL said the condition was reported, to be a papilloma with an inflammatory base; therefore why inquire as to tubercle?

Mr. R. J. WRIGHT, commenting on Mr. Tilley's advice to give iodide of potassium referred to a very unfortunate experience he had had a few years ago in the case of a lady with a doubtful laryngeal lesion and no manifest signs in the chest. Following full doses of iodide of potassium for less than a week, the laryngeal condition flared up and never subsided, patient dying in two months. He believed, the potassium iodide definitely hastened her end.

20 Dundas-Grant: *Case of Palato-labial Dysarthria*

Sir JAMES DUNDAS-GRANT considered the condition tuberculous. Recently he saw a young lady who had huskiness and signs of tuberculosis of the larynx, but no cough, and he could obtain no expectoration for examination. The irritation caused by the examining mirror made her cough; this caused a smudge on the mirror, immediate examination of which revealed tubercle bacilli. A similar opportunity also occurred in another case.

Mr. WORTHINGTON said the remarkable local persistency of papilloma in many cases should be remembered. He had a female patient with a large crop of papillomata between the cords and at the anterior angle, which he removed. The oftener he removed them the faster they grew, and they then appeared on the arytenoids. Sections of the growths showed simple papillomata. He came to the conclusion that laryngo-fissure was indicated but decided first to try diathermy. After two applications all the papillomata disappeared.

Dr. BROWN KELLY considered the condition tuberculous and was suspicious of the presence of ulceration behind the prominent tissue. He advised examination by the suspension method.

Mr. DOUGLAS HARMER said he had tried diathermy for these cases, and, more recently, radium, and he had no doubt that radium gave by far the better results; there was a better voice, and the healing was as good as that after diathermy. In such a case as the present one, where there was general thickening—supposing this was papilloma—it was sufficient to apply radium externally. But with a patient who had papillomata more or less filling the larynx, preliminary tracheotomy should be done, placing the tube for irradiating from below, above the tracheotomy tube, and giving three or four short exposures. After the rapid disappearance of the growths a normal larynx was left and the voice was good. After three to six months the tracheotomy tube could be removed, and the patient was cured.

The PRESIDENT said he had employed the instrument which was used in Berlin for mesothorium applications. He had been thoroughly satisfied with the effects of radium treatment in recurring papillomata of the larynx.

Mr. LESLIE POWELL (in reply) said the patient had been an alcoholic subject for many years, and that probably accounted for the progressive weakness. Thorough examination failed to detect tubercle in his lungs. The condition had remained practically the same for two years, and that fact was against its being tubercle. He had himself inclined to the view that there was perichondritis, but it was a long time for that to have persisted after the operation. If it had been malignant one would have expected more local extension by this time, and had it been papilloma, he would have thought more growths would have developed. In spite of the negative Wassermann reaction he gave iodide of potassium for some time, but there was no improvement.

Case of Palato-labial Dysarthria.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

PATIENT, a male, aged 50, complained of a constant cold; the nose and nasopharynx were free, but the palate was almost immobile, and the action of the lips in articulation extremely defective; the tongue had apparently entirely escaped, and the vocal cords, beyond a slight paresis of the internal tensors, moved perfectly. This case differs from an ordinary case of bulbar disease. Patient is peculiar in his manner, and I think it is possibly a case of general paralysis.

**Case of Dysphagia occurring in a Male Subject of Hemiplegia ;
Inflammation of Submaxillary Salivary Gland ; Calculus
in Wharton's Duct.**

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

A MAN, aged 46, with remains of hemiplegia of left side of body and face, which occurred suddenly about four years ago, has had great pain and inability to swallow solids for three weeks, and difficulty in opening mouth; peritonsillar region and larynx normal; dense induration and swelling in the left submaxillary region extending from the mandible to the larynx; suggestive of gumma; really inflammation of submaxillary salivary gland; salivary calculus felt in sublingual region; extraction of calculus; escape of a little muco-purulent fluid; relief.

DISCUSSION.

The PRESIDENT exhibited a calculus which he had removed from a somewhat similar case through the mouth. He had considerable difficulty in diagnosis, as he was not sure whether or not the condition was inflammatory, since the gland was so hard, caused by intense fibrosis which simulated malignant disease.

Dr. JAMES DONELAN referred to the case of an old lady, from whom he removed a calculus in Wharton's duct. After removal the symptoms rapidly disappeared. A similar quick result might be expected in the present case on removing the remaining calculi. His own case was not complicated by paralysis.

Sir JAMES DUNDAS-GRANT (in reply) considered the concurrence of hemiplegia as a mere coincidence, without causal connexion.

**Case of Dysphonia approaching Aphonia, simulating Laryngeal
Tuberculosis ; probably Mucous Patches on Vocal Cords.**

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

A MIDDLE-AGED man with almost complete loss of voice was suspected of being tuberculous; lungs were found normal; no tubercle bacilli in sputum obtained by provoked cough; referred to throat department of Brompton Hospital; laryngoscope revealed greyish opalescent patches on anterior two-thirds of the vocal cords, probably of the nature of *plaques muqueuses*: referred for Wassermann test.

DISCUSSION.

Mr. TILLEY referred to a case he had shown before the Section about six years ago, a male with two small lenticular plaques on the anterior third of each cord. The case had since been referred to in the American Laryngological Association. There was no history of syphilis, and iodide of potassium and mercury had no effect upon the condition. Sir StClair Thomson had suggested it might be tuberculosis, but he did not think that could be seriously maintained, because the man was in such robust health, and he had no symptom except slight hoarseness.

Mr. HARMER regarded the patient as an ordinary carrier; there were a number of people who could be so described, i.e., they carried influenza, or pneumococcus or streptococcus. This man said that, for the first time, he had been subject to a very explosive, spasmodic cough, which came on without warning. This was very typical of these carrier cases, who were subject to laryngeal changes of the type here seen.

Dr. BROWN KELLY said the appearances were, to him, reminiscent of a fibrinous deposit on an ulcerated surface, such as he had seen in men during the War, who had laryngitis from gas, shouting, &c.; it covered the anterior two-thirds of the vocal cords, and gradually disappeared. Similar appearances might be due to influenza, and he asked whether this patient had had influenza, but the reply was in the negative.

Sir JAMES DUNDAS-GRANT referred to four conditions which might produce a similar appearance. First, mucous plaques of syphilis. A second cause was the laryngitis produced by gassing, as in several cases admirably described by Dr. Brown Kelly. It was so long since this man could have been exposed to anything of that kind, that it was not likely to have been the cause in this case. The third was tuberculosis. Fourthly, chronic laryngitis with superimposed pachydermia. In the *Archives of Laryngology*, cases of "fibrinous corditis" were described; they were pictured as necrosis of the superficial epithelium. The writer of the article found he could remove portions of the fibrinous plaques for microscopical examination without doing serious harm. Some showed pachydermia, some fibrinous exudation. In the present case he did not doubt the nature was syphilitic, in spite of the negative Wassermann reaction; the man in fact admitted he had had primary syphilis when in the Army. It has almost disappeared under iodide of potassium.

The PRESIDENT remarked that one would have expected a positive Wassermann reaction if the plaques were syphilitic in origin.

? *Endothelioma of the Larynx.*

By WALTER HOWARTH, F.R.C.S.

MRS. D., aged 52; seen May, 1921, with history of hoarseness for two years previously. Laryngeal examination showed a smooth red swelling occupying anterior two-thirds of left ventricular band, and completely hiding left vocal cord. It was thought that it might be a lipoma. When examined by the direct method it was found to be more extensive than was at first thought, and the cord was found to be fixed. Laryngo-fissure, June, 1921. The tumour, including the whole of left ventricular band and vocal cord, and one-third of ventricular band and vocal cord on right side, removed. Bleeding was very violent and made the operation difficult. Uninterrupted recovery.

PATHOLOGICAL REPORT ON SECTIONS OF THE TUMOUR BY PROFESSOR S. G. SHATTOCK, F.R.S.

"The tumour consists of voluminous compact masses of cells the peripheral elements of which are subcolumnar and have a palisade arrangement. In the midst of the cell masses there is a conspicuous number of capillaries, the tumour cells around which are likewise of the palisade kind. The capillaries are everywhere invested with a small amount of connective tissue, which excludes a diagnosis of perithelioma. The neoplasm may be regarded as a carcinoma arising from the investing epithelium, and of the basal celled or non-squamosal variety. Many intact mucous glands occur in the section."

DISCUSSION.

The PRESIDENT said Mr. Howarth was to be congratulated on showing what he (the President) believed to be a unique case. He had seen a case of endothelioma of the nasopharynx, but not in the larynx. In his case, that of a lady, he had been watching the condition for four and a half years. When first seen he removed a portion of the growth for microscopical examination and again on five other occasions; and the opinion of different people in each instance was endothelioma. Patient was doing quite well, and the lesion gave remarkably little trouble.

Dr. W. HILL remarked on the small amount of deformity seen after such an extensive operation for malignant disease. Malignant endolaryngeal tumours were very uncommon indeed, particularly in women.

Dr. IRWIN MOORE said he had searched through the entire literature of malignant growths of the larynx up to 1919 for his monograph on "Intrinsic Cancer of the Larynx," and he could find no record of an endothelioma of the larynx.

Mr. F. H. DIGGLE said that a mixed tumour—endothelioma—of the larynx, a sub-glottic growth, had been recorded in 1920 from the Mayo Clinic.¹

Mr. HOWARTH (in reply) said he was much indebted to Professor Shattock for his examination and description of the tumour. In his search through the literature—not an absolutely thorough one—he had been unable to find the record of a similar case.

? Sarcoma of Ethmoid and Antrum.

By WALTER HOWARTH, F.R.C.S.

CHILD, aged 9, with three months' history of swelling of nose and difficulty in breathing at night. There is a diffuse firm swelling on left side of the nose. Intranasally, large ragged polypoid growth that bleeds easily. There are stony-hard lumps at the angles of the jaw and on right side of the neck.

DISCUSSION.

Mr. F. H. DIGGLE considered that the growth involved the septum, and might even have arisen on the left side of the septum.

Mr. TILLEY considered that the growth probably arose from the left ethmoidal region, ulcerated through the septum, and was now showing itself in the right fossa. One of the early signs of the disease had been a watering of the left eye. It would be agreed that in such a case ordinary operative procedures would be out of the question. He recommended deep penetration with X-rays. He had seen a gentleman in October, 1921, with the same condition: epiphora, an anæsthetic condition over the left cheek, and in the left nasal cavity a red vascular growth which bled easily. There was lancinating pain, great deafness and tinnitus in the left ear. The X-rays were applied in October and when he saw patient a fortnight ago he was astonished to find an apparently normal left nasal cavity, a complete disappearance of the proptosis, and that he could even breathe more freely through the left nostril than through the right. But he then had a hard mass of glands under the right sternomastoid (the primary trouble having been on the left) therefore he arranged for a further irradiation of this mass.

¹ G. B. New, "Mixed Tumours of the Throat, Mouth and Face," *Collected Papers of the Mayo Clinic*, 1920, xii, p. 841, in which an illustration is given of a mixed tumour of the larynx; duration twelve years (fig. 262, p. 850).

This had now certainly disappeared for the time being. During the treatment patient hawked up bits of chamois-leather-like material, and there was an unpleasant odour, probably due to the necrosed débris.

Mr. NORMAN PATTERSON inquired whether microscopical examination had been made of the growth in this case, also in that recorded by Tilley, and remarked that X-ray or radium treatment were much more effective in sarcoma or endothelioma than in carcinoma.

Mr. WOODMAN suggested that this growth originated from the septum. The left antrum was dull to X-rays and to transillumination; did it contain pus, or growth? It was very unusual for a growth starting in the antrum or the ethmoid to perforate through the septum, except in the upper region of the septum or in the sphenoidal region. He could recall five cases in which the growth began in the septum and spread centrifugally, growing upwards and downwards. There was an indefinite microscopical report of mild malignancy. He (Mr. Woodman) suggested there was need for pathological investigation of these nasal tumours, so that laryngologists could have a clearer idea of their nature and the prognosis in such cases. Probably this condition would clear up under radium.

The PRESIDENT said all would agree as to variations in the degree of malignancy in these growths; some were very malignant, others semi-malignant, while a third group were very innocent in their clinical course.

Dr. W. HILL thought it was too much to say that intensive irradiation was the only hopeful treatment for such cases; surely Mr. Tilley had seen good results from radium in these growths; in fact the more malignant the better the result. But radium did not act well in granuloma. He would employ both radium and the X-rays.

Mr. LESLIE POWELL had seen a similar case, that of a small boy, who had a large swelling of his cheek, bulging into the palate, and there was also proptosis. Operative treatment had no effect but after X-ray treatment all signs of growth disappeared for eighteen months, when there was some recurrence. He had since lost sight of the patient.

Mr. W. M. MOLLISON thought the growth was more septal than ethmoidal, as there was no such thickening of the bridge of the nose. He had seen sarcoma of the ethmoid produce some displacement of the eye, and much more swelling in the orbit than on the bridge of the nose.

The PRESIDENT remarked that no reference had been made to Coley's fluid, and referred to Mr. Mansell Moullin's paper on the use of this fluid in cases of inoperable sarcoma, quoting two or three cases which, at that time, had been cured by it. His (the President's) own experience was limited to three cases. In two it made no difference, but in the third improvement occurred, though it did not cause disappearance of the growth. In the present case he thought every modern method should be combined, and he suggested that Mr. Howarth should first try Coley's fluid and if it failed then cross-fire treatment by both radium and X-rays.

Mr. HOWARTH replied that he proposed to rely on radium in this case, applying two pieces intranasally, and one piece outside. He would report later.

Postscript.—On further investigation the condition was proved to be tuberculous, involving the left ethmoid, the upper part of the septum and both nasal bones.

Papilloma of Cheek and Palate treated by Diathermic Cauterization.

By WALTER HOWARTH, F.R.C.S.

MALE, aged 40. When first seen two years ago, there was a diffuse papillomatous condition of the inside of the left cheek, floor of mouth and palate; this has been treated on three occasions and completely disappeared. At the present time there is a small recurrence, which it is proposed to treat on similar lines.

DISCUSSION.

The PRESIDENT suspected malignancy in this case, though originally it was probably papilloma. He did not like the hard elevated look of the edge, nor the deposition of white horny epithelium inside the mouth. He remembered a case which was treated as an innocent condition—as it probably was at that stage—but became malignant, caused very great infiltration and enlargement of the glands of the neck, and proved fatal.

Sir JAMES DUNDAS-GRANT said he was reminded of an earlier stage of a case which he showed before the Section two meetings ago, that of an elderly Frenchman, who had ulceration on the left side of the fauces and left cheek. He had a colour-drawing made. Patient had been treated by X-rays, but he was going down-hill; he was a heavy cigarette-smoker. The present case, he strongly suspected, would eventually prove to be malignant.

Mr. HOWARTH replied that this case was referred to him by Sir Cuthbert Wallace two years ago, and when he (Mr. Howarth) first saw the patient, the whole left side of the mouth, soft palate, lips and floor of the mouth, were covered with whitish growth, of which a small portion could still be seen. The pathologist reported that it was papilloma. It had practically all disappeared under light diathermic cauterization. The last treatment was given six months ago, and the present condition had appeared only recently. He proposed again to apply diathermy, but in view of the President's opinion, he would also remove a portion from the growing edge, and report later.

Double Abductor Paralysis.

By WALTER HOWARTH, F.R.C.S.

MALE, aged 25. The condition was discovered when the patient was anaesthetized for an operation on the nasal septum; considerable stridor was noticed, and direct laryngoscopy revealed the present condition. The history is indefinite, but it would appear that alteration of voice and noisy breathing at night has been noticed for at least eighteen months. It is suggested that a bulbar lesion is probable. The Wassermann reaction is negative.

DISCUSSION.

The PRESIDENT regarded this as a post-diphtheritic condition.

Mr. F. H. DIGGLE said the boy had no trouble with his throat until he had influenza; he then had difficulty in breathing, and this suggested a post-influenzal neuritis.

26 Moseley : *Suction Apparatus for Nose and Throat Operations*

Dr. P. WATSON-WILLIAMS thought there might be here a diphtheritic or some other infection, and it was not always possible to exclude the former. Some cases reported as paralysis, following streptococcal infection, were probably due to the Klebs-Loeffler bacillus in an undiagnosed diphtheria. As to whether it was a bulbar lesion, one often obtained valuable information from noting whether there was a persistent frequency of the pulse; if there was a bulbar degenerative lesion, the cardio-inhibitory bulbar nuclei were often involved. He had not seen the case, but if there was complete double abductor paralysis alone, the boy ran a great risk of sudden dyspnoea. Intubation or tracheotomy would probably obviate that risk; the latter should be done if the condition was permanent, and in any case of simple complete double abductor paralysis one should be prepared to perform a tracheotomy at a moment's notice.

Sir JAMES DUNDAS-GRANT elicited from the patient that earlier in the case-history the stridor was more marked than now, and that that might have been when only the abductors were involved, in accordance with Semon's law. At present the adductors were probably enfeebled, and the boy might be approaching a state of complete recurrent paralysis, or else the condition was subsiding. At present the breathing was fairly comfortable.

Dr. DONELAN doubted whether there was complete abductor paralysis. There was considerable movement of the cords, and a fair breathing space. Some paralysis of the palate was present, as shown by regurgitation, and there seemed to be sub-glottic thickening, which possibly supervened on an inflammatory condition.

Mr. H. V. FORSTER said that a few days ago he had seen a boy who complained of stridor, and some abductor paresis was apparently present. Tracheoscopy showed a "scabbard trachea," due to lateral pressure of an enlarged thyroid, which, however, had not been noticed externally. The trachea could be dilated by the examining tube, and the carina viewed.

Dr. W. HILL inquired whether the stridor was inspiratory or expiratory.

Dr. KELSON said the case seemed to him to be one of post-influenzal paralysis getting well. The boy was very clear about it having come on after influenza, and the speaker did not think tracheotomy was necessary. Many years ago, at the old Laryngological Society, he showed a similar case which followed influenza.

Mr. PHILIP FRANKLIN said that he had recently seen a case of bilateral abductor paralysis, following an attack of influenza. The condition improved and the larynx again became normal.

Mr. HOWARTH replied that he would have liked to think this condition was influenzal, as he had a case, with Mr. Tilley, some years ago, in which a similar condition followed influenza. But it was ascertained that the influenza occurred last August, whereas the stridor had been noticed as far back as the preceding February. The reason he thought it might be a congenital syphilitic lesion was that the teeth seemed almost typically syphilitic. He thought it was double abductor paralysis, which was proceeding to complete paralysis, and if that occurred there would be no need for tracheotomy.

Postscript.—On further investigation by a neurologist, the case has now been diagnosed as one of myasthenia gravis.

Suction Apparatus for use in Nose and Throat Operations : Demonstration.

By C. K. MOSELEY.

THIS little suction pump is designed on the rotary principle, and it has the valuable new feature that it is directly attached to a small motor of $\frac{1}{16}$ h.p., which can be supplied to work from any electric lamp socket and for any voltage.

The little unit is quite small, and weighs only a few pounds. It runs quite quietly at 1,000 to 1,200 revolutions, and provides sufficient volume or suction to draw away from a wound the blood and any other secretion as fast as it is discharged, so that the surgeon can proceed much more quickly with the operation than he could do under present conditions, which demand frequent pauses to allow for swabbing. With the new pump swabbing can be practically dispensed with altogether.

The secretions are drawn away into a Wolff's bottle, so that only pure air passes through the vacuum pump itself.

This apparatus can also be used to supply air-pressure to an ether bottle. It is obviously quite portable, and is mounted on a suitable board with the Wolff bottle complete. It is also supplied with a suitable length of flexible cord for connexion to a lamp socket, and also has a switch attached in a convenient place for starting and stopping the machine.

Any type of instrument required for drawing away the secretions should be attached to the end of the rubber suction tube. The precise form of the instrument, which preferably should be spoon-shaped, is determined by the nature of the operation to be performed.

DISCUSSION.

Mr. MOSELEY remarked that since he had introduced this apparatus in the East Suffolk Hospital, also in private, the employment of swabs had been abandoned. In bronchoscopic examination it was particularly useful, also in operations on the throat and nasal passages.

Dr. P. WATSON-WILLIAMS asked whether there was not difficulty in dealing with clotted blood in the use of this apparatus. Twenty years ago he introduced and used a similar suction apparatus at Bristol Royal Infirmary, but relying on a continuous hand pump. He found a difficulty was the choking of the tube by clots of blood. He congratulated Mr. Moseley on this apparatus, with the more powerful and continuous action.

Dr. SHIPWAY said he had been using the Sorensen suction apparatus for several months, chiefly with Mr. Mollison; it kept the area of operation clear of blood, mucus, &c., and at the same time delivered a stream of anæsthetic vapour. He had found the apparatus of much value, and thought the method represented a great advance in this special branch of surgery.

Mr. W. M. MOLLISON confirmed all that Dr. Shipway said about the American apparatus. Mr. Moseley's apparatus was neater and less noisy than the American product, but the Sorensen apparatus was more powerful and delivered the anæsthetic at the same time. It had been introduced to Guy's by Mr. Zamora two years ago. Dr. Shipway had had a device fitted to his which rendered it quieter in working. It had proved most useful in tonsil operations; no blood escaped down the throat, and it supplied an almost dry field and thus made enucleation easier and quicker. By means of a narrow tube it could be used in nasal operations. He had also used it for mastoid operations, the tube being held at the bottom of the cavity, leaving the operator free to operate without the necessity of constant swabbing. It was also very valuable in bronchoscopy.

Mr. NORMAN PATTERSON and Mr. T. B. LAYTON supported Mr. Mollison's experience.

Dr. DONELAN said the Moseley turbine apparatus was not so powerful as the Sorensen, and he suggested an increase in the number of blades, would give greater power. He hoped its employment during tonsillectomy would not deter members from picking up and ligaturing bleeding points in the tonsillar fossa.

28 McKenzie: *Sarcoma of Lower Pharynx treated by X-rays*

Mr. MOSELEY (in reply) said no trouble had been experienced in sucking up blood clots in the bottle. To facilitate removal, it was well to suck up a little saline solution first. In the case of a soft foreign body lodged in a bronchus, the suction apparatus could be so arranged that it would suck the body out, without the intervention of forceps.

Sarcoma of Lower Pharynx treated by X-rays: Disappearance of the Growth.

By DAN MCKENZIE, M.D.

MALE, aged 66, first seen September 19, 1921, complaining of a hard painful swelling on the right side of the oral pharynx, which he had discovered fourteen days previously. The vocal cords were seen moving normally, but at the end of October hoarseness set in, and early in November the right cord was seen to be fixed in abduction, while the right arytaenoid was swollen, and there was visible a swelling on the right lateral wall of the pharynx about the level of the upper orifice of the larynx and extending downwards. On November 8, portions of this tumour, removed by the direct method, showed "all the histology of a large round-celled sarcoma."

Patient has been under X-ray treatment by Dr. Robert Knox at the Cancer Hospital, and has had five exposures.

On January 23, 1922, examination of the larynx showed that the cords were moving normally; the arytaenoid swelling had disappeared and the tumour on the right side of the laryngo-pharynx, from which the pieces were taken for examination, was no longer visible.

Specimen of Cyst of Tonsil.

By T. JEFFERSON FAULDER, F.R.C.S.

SECTION of the upper half of left tonsil. Microscopical Report by Dr E. L. Hunt: "The thin wall of the cyst is lined on each surface with squamous epithelium, and the inner layer of squamous epithelium is continued round the inner surface of the cyst. Depressions on the inner surface of the cyst wall are also lined by squamous epithelium, and this is sometimes seen in the section cut parallel to its surface."

From a female patient, aged 45, who suffered periodically from dysphagia. The cyst projected from the upper pole of the left tonsil. It had a translucent appearance. It varied in size from time to time, sometimes being so large as to displace the uvula and soft palate.

THE following cases have been referred for later publication until further investigations or completed reports have been submitted:—

W. H. KELSON, M.D.: "Case of Laryngeal Growth."

Sir JAMES DUNDAS-GRANT, K.B.E., and C. J. WORSTER-DROUGHT, M.D.:
"Case of Immobility of Left Vocal Cord and Deafness of Right Ear."

**Operations for the Removal of Tonsils and Adenoids:
Resolution by the Council of the Section.¹**

IN view of the great number of children requiring operations for the removal of Tonsils and Adenoids, and of the varying standard of the provision made by Hospital and Local Education Authorities for such operations, the Council of the Laryngological Section of the Royal Society of Medicine, after careful consideration, desire to make the following suggestions:—

(1) That all clinics, whether at Hospitals or Schools, should be in the charge of surgeons with special experience of diseases of the nose, throat and ear, so that, *inter alia*, a wise selection may be made of cases requiring operation, and others not requiring operation may be appropriately treated.

(2) That all patients requiring operations for tonsils and adenoids should have in-patient institutional treatment, and that a stay of at least forty-eight hours should be insisted on, and a further stay if thought advisable by the medical officer in charge.

(3) That parents should be given printed instructions as regards the preparation of the patient for operation, and of the room to which the patient will return.

(4) That before the patient is admitted for operation, inquiries should be made by a responsible authority, as to the home conditions and circumstances, especially with reference to the presence of infectious disease.

(5) That when the patient leaves the hospital, printed instructions with regard to after-treatment should be given (as per scheme appended).

(6) That anæsthetics should be given by anæsthetists with special experience of these operations.

(7) That after the patient leaves the hospital with the printed instructions for after-treatment, arrangements should be made for the supervision of a qualified visiting nurse.

The Council were of the opinion that where it is impossible in large cities to provide hospital accommodation for all the cases, the provision of open-air buildings near the city, adequately equipped for operative treatment, would offer many advantages. These would be specially useful in connexion with school clinics.

Until such provision of adequately equipped in-patient clinics can be arranged, and where it is not possible to keep every child in hospital for forty-eight hours after operation, and the child is operated on in an out-patient department, the Council recommend that several further conditions should be fulfilled:—

(1) That printed instructions should be given to the patient with regard to preliminary preparation, and investigation should be made beforehand—e.g., by a "care committee", or a visiting nurse—as to the adequacy of the home accommodation and supervision, and also the absence of adverse sanitary conditions, risks of contagion, &c.

(2) That proper waiting-room accommodation should be provided for patients before operation.

¹ At a Meeting of the Council, held March 3, 1922.

Resolution of the Council

(3) That the recovery room should be scrupulously clean, warm and well-ventilated, and provided with separate beds or couches for each patient.

(4) That patients should be detained in the recovery room until pronounced fit to leave by the surgeon in charge or his deputy.

(5) That the recommendation that the child should be visited by a nurse after discharge from the hospital should be insisted on with even greater force in the case of children who are denied the safeguards of in-patient accommodation.

(6) That every child who is sent home on the day of operation should be transferred by an ambulance or hired conveyance. Travelling by public tram, bus or train so shortly after operation is most undesirable, and a source of distress and often of infection.

(Signed)

W. MILLIGAN, *President of Section.*

WALTER G. HOWARTH, } *Secretaries of Section.*
T. B. LAYTON, }

Section of Laryngology.

President—Sir WILLIAM MILLIGAN, M.D.

DISCUSSION ON THE TREATMENT OF MALIGNANT GROWTHS OF THE NASAL ACCESSORY SINUSES.

(I) ILLUSTRATIVE CASES AND SPECIMENS.

Case of Carcinoma (Spheroidal-celled) of Right Antrum, removed by Operation.

By E. MUSGRAVE WOODMAN, M.S.

PATIENT, a male, aged 62, labourer, admitted General Hospital, Birmingham, November 3, complaining of stoppage of right side of nose, and neuralgic pains right side of jaw. A large red growth was found in the nostril, causing bulging of the right side of the nose and the adjacent portion of the cheek. There was a hard gland below the right side of the jaw. The right antrum was found to contain a large mass of growth, which extended up to the frontal sinus and into the sphenoid, and had eroded the hard palate.

Case of Double Myxo-sarcoma of the Face.

By E. MUSGRAVE WOODMAN, M.S.

PATIENT, a female, aged 40, complaining of nasal obstruction and with a diagnosis of nasal polypi. On examination a large number of apparently innocent polypi were seen in the nares and post-nasally. Both antra were dark on transillumination.

First Operation (August 3, 1920).—The polypi were removed from both ethmoidal regions, those in the upper part being of a fleshy character, and microscopically proved to be rapidly growing sarcoma. This was confirmed by very rapid and extensive recurrence within a few days.

Second Operation (August 19, 1920).—Extensive resection of the sinuses on both sides of the face by an external exposure. Sarcomatous masses were found in both antra and in both frontal sinuses. The ethmoids were involved and were completely removed, also the sphenoidal sinuses were full of growth which extended upwards and forwards to the cribriform plate. Subsequently, for three days patient had typical meningitis associated with severe pain, photophobia, and high temperature; this cleared up after three or four days. Since that time she has had X-ray treatment once a month, and has gradually recovered her health and has had no recurrence.

Endothelioma of Right Antrum, Ethmoids, Sphenoid, &c.

By A. J. HUTCHISON, M.B.

PATIENT, a male, aged 61. History: More or less stoppage of nose and loss of smell for fifteen years. Dirty yellow discharge from right side of nose

JE—L 1

[March 3, 1922.]

first appeared in September, 1919. In October, 1919, large quantities of polypi were removed from the right side of the nose and the right maxillary antrum, and one polypus from the left side of the nose. In April, 1920, the right eye was being displaced outwards, the right cheek was swollen, painful and tender. The right side of the nose bled frequently and pretty copiously, and on inspection the right turbinals, &c., were seen to pulsate.

Moure's lateral rhinotomy operation was performed, and a large mass of pale, dense rather avascular growth was removed from right antrum, ethmoidal region and floor of orbit. Some of the growth in the orbit was overlooked at this operation and continued to grow. X-ray treatment had no effect. December 13, 1920: Operation repeated, removal of same kind of pale, soft tissue from orbit, antrum down to alveolar process, ethmoid and sphenoid regions.

After this operation patient remained in fairly good health, proptosis became less, but the eyelids were displaced. Vision gradually diminished in the right eye. Radium was applied in March and July, 1921, by Mr. Pinch. Vision was completely lost after first application.

At present date, the right eye has become more proptosed, the mouth can be opened only a little, the roof of mouth and inside of nose have not altered in appearance during the last six months, but enlarged glands can now be felt below the jaw on both sides and down both sides of neck. Very little pain is complained of; 5 gr. of aspirin at night secure rest and sleep.

Spindle-celled Sarcoma of the Left Maxillary Antrum.

By F. J. CLEMINSON, M.Ch.

PATIENT, a male, aged about 50, was exhibited at a meeting of this Section in December last with a nine months' history of left-sided nasal obstruction and epiphora. No bone could be detected in the left side of the hard palate, or in the floor of the left orbit. There was proptosis of the left eye. The left side of the nose was completely obstructed by a bulging inwards of the outer wall, and the left side of the hard palate was pushed downwards into the mouth. Two radiograms (by Dr. Russell Reynolds) are shown to demonstrate the loss of bone.

January 25 a Caldwell-Luc operation was performed by Mr. Badgerow, and a large tumour growing from the outer wall of the antrum, with a prolongation forming an antro-choanal polypus, was removed. The tumour is shown, with a section made by Dr. Hunt, who reports that the growth is a spindle-celled sarcoma.

The patient is now being treated at the Radium Institute.

Rodent Ulcer involving Orbit, Maxilla and Antrum.

By W. DOUGLAS HARMER, M.Ch.

To illustrate treatment of malignant disease in bone by diathermy.

Patient, a male, aged 60. Ulceration eighteen months involving eyelids, conjunctiva, eye (completely destroyed), orbital structures, maxilla and antrum. January 4, 1922: Whole area excised with diathermy knife. Sequestrum nearly ready for removal.

Endothelioma of Maxilla and Antrum.

By W. DOUGLAS HARMER, M.Ch.

To illustrate treatment by radium after failure of surgical measures.

Patient, a female, aged 49. Swelling on outer aspect of maxilla first noticed June, 1920. Large encapsuled tumour excised February, 1921. Recurrence with extensive involvement of lower part of maxilla and antrum April, 1921. Radium 200 mg. buried in antrum for twenty-four hours April 4, 1921. This caused extensive necrosis, and sequestrum was removed later. Now no sign of recurrence, but plastic operation required.

Spheroidal-celled Carcinoma of Nasal Fossa and Antrum.

By W. DOUGLAS HARMER, M.Ch.

To illustrate treatment by radium after recurrence.

Patient, a male, aged 61. January, 1920: First noticed swelling and obstruction in left nasal fossa. November, 1920: Growth removed locally and reported to be a spheroidal-celled carcinoma. December, 1920: Radical removal by Moure's operation. March, 1921: Growth again removed, with left half of hard palate. November, 1921: Recurrences treated by diathermy and radium 100 mg. six hours. Now has enlarged gland in neck.

Carcinoma of Nasal Fossa and Antrum.

By W. DOUGLAS HARMER, M.Ch.

TREATMENT by intranasal excision. Later carcinoma of external auditory meatus treated by excision and removal of glands from the neck.

Patient, a male, aged 39. Nasal obstruction first noticed 1914. Fragment removed and reported to show papilloma, possibly malignant. May, 1914: Radical removal of growth with inferior turbinate and nasal wall of antrum. August, 1915: Epithelioma of external auditory meatus excised by Mr. Sydney Scott. This caused facial paralysis. May, 1916: Glands dissected from right side of neck by Mr. West. 1920 and 1921: Plastic operations for facial paralysis.

Case of Tumour of Doubtful Nature removed from Right Ethmoidal Region.

By H. G. BEDFORD RUSSELL, F.R.C.S.

PATIENT, a male, F. H., aged 30. Epistaxis early 1917. Submucous resection same year. Right nasal obstruction 1920. "Polypi" April, 1921, a section of which is on view and was diagnosed as sarcoma.

In October, 1921, a smooth firm tumour filled right nasal passage and projected into nasopharynx, not bleeding on palpation. On Mr. Harmer's advice I removed it by osteoplastic removal of the maxilla, the incision being a modification of Mr. Trotter's, designed to avoid injury to the lacrymal apparatus. The exposure was satisfactory; the tumour, which was soft and pulpy at its origin, appeared to grow from the ethmoidal region, not the basis

cranii, and its removal was not attended by the expected hæmorrhage. A few days later 100 mgr. of radium was left in the right ethmoidal region for one hour.

The growth, with early and late sections, is shown. I should be glad of opinions as to its nature. Pathologists have variously diagnosed it as "fibro-angioma" and "sarcoma." Any suggestions as to further treatment would be welcomed.

Epithelioma of Ethmoidal Region Five Years after Operation.

By DAN MCKENZIE, M.D.

THE patient, a woman, aged 46, has been before this Section¹ on two previous occasions. The new growth had been the cause of serious hæmorrhages for two years before removal; it presented the familiar "wasp-nest-grey" colour of these growths. Removal was rapidly and successfully accomplished through a lateral nasal incision. It involved the entire left ethmoidal region, and had passed into the orbit and sphenoidal sinus.

Ineradicable Endothelioma of the Superior Maxilla (Antrum) under Treatment by Diathermy.

By DAN MCKENZIE, M.D.

PATIENT, a female, aged 27, has been under supervision for nearly two years. The growth, when first seen, had penetrated the bone of the canine fossa and hard palate, and for that reason it was considered to be beyond complete removal. The growth, in its original seat and various and varying extensions into the nasal chamber, the pterygo-maxillary fossa and the orbit, has been exposed some twelve or fourteen times to the destructive action of diathermy. The external carotid artery has been ligatured, and the glands in the neighbourhood removed; they showed endotheliomatous deposit.

The exhibitor is disposed to claim that this treatment has been holding the neoplasm at bay.

Carcinoma of Left Ethmoid Region.

By T. H. JUST, M.B.

PATIENT, a male, aged 58, had complained of nasal obstruction on the left side for years. Lately the left nostril had filled up, and the left side of the nose stretched over the face. Occasional bleeding had occurred. September 27, 1921: Growth removed through a lateral rhinotomy, the transverse incision being carried out through the lower conjunctival sac in the manner suggested by Mr. Trotter. The growth was found to involve the left ethmoid, the anterior part of the septum, and to be attached to the inner aspect of the left side of the nose and vestibule; all visible growth was removed, including the anterior part of the septum. There is no sign of recurrence. The patient has had X-ray treatment since the operation as a prophylactic measure against recurrence. Microscopic section shows an atypical columnar-celled carcinoma.

¹ *Proceedings*, 1917-18, xi, p. 31.

Squamous and Prickle-celled Carcinoma of Hard Palate and Right Antrum.

By NORMAN PATTERSON, F.R.C.S.

PATIENT, a female, aged 63. Excision of right superior maxilla, April 5, 1917 (nearly five years ago). April 25, 1917 (three weeks later): Whole cavity from which the growth was removed treated with diathermy. February, 1919 (twenty-two months afterwards): Small nodule (epithelioma) developed in scar of upper lip. Destroyed by diathermy, and subsequently plastic operation performed. This was evidently an implantation growth. July 20, 1921: Patient readmitted with large hard gland underneath upper part of right sternomastoid. Block dissection of anterior and posterior triangles, the greater part of sterno-mastoid muscle and internal jugular vein removed. Patient now appears to be free from growth. A few weeks ago sent to Dr. Morton for X-ray prophylactic treatment.

Papillary Columnar-celled Carcinoma of Right Antrum and Ethmoid.

By NORMAN PATTERSON, F.R.C.S.

PATIENT, a male, aged 38, one year after operation and diathermy. In 1917: Five operations on nose at Leicester, one under general, four under local anaesthetic. In 1918: Two operations at Canadian Hospital, Folkestone. February, 1921: Seen by exhibitor; right side of nose almost completely occupied by cheesy material (caseous rhinitis); after its removal a tumour was discovered, which proved to be carcinomatous. February 28, 1921: Moure's lateral rhinotomy operation, preceded by preliminary ligation of external carotid. Excision found to be impossible, so growth removed with curette, followed by very thorough diathermy of the cavity from which it was removed. Union took place by first intention, but a fistula subsequently developed. The case shows well the amount of bony necrosis which follows diathermy.

(II) DISCUSSION.

Mr. E. MUSGRAVE WOODMAN.

I SHALL not discuss the various operations which have been recommended for malignant disease in this situation, but would call attention to the paper by New in the volume of the Mayo Clinic for 1920,¹ in which he advocates destruction of the growth by a red-hot poker, followed by radium. This shows what crude methods are still being employed.

Before deciding on operation the degree of malignancy present and the extent of the disease must be considered.

It is sufficient to call attention here to the wide range and variations in malignancy which may be present. Some cases may be most malignant whilst others are only slightly so. Fortunately in this area the growths recur locally

¹ G. B. New, "Treatment of Malignant Tumours of the Antrum," *Collected Papers of the Mayo Clinic* (1920), 1921, xii, pp. 786-797.

and are not disseminated in the glands, or in the body, except occasionally. If the disease is only partially removed it recurs rapidly but is not disseminated. It is equally important to know the extent of the disease, and this is best ascertainable by X-rays.

What cases, therefore, of malignant disease in this area should be considered inoperable? Evidently many cases which a few years ago would have been considered hopeless come well within the range of operability. I suggest that the following cases are inoperable: (1) Sarcoma arising primarily from the base of the skull and secondarily involving nasal accessory sinuses; (2) extensive involvement of the pterygo-maxillary fossa; (3) cases in which signs of persistent meningeal irritation are present; (4) extensive involvement of the orbit with symptoms which suggest invasion of the cavernous sinus, and in which removal of the orbit will not eradicate the disease.

The operative posture and the question of the anæsthetic are very important. The upright position has undoubted advantages: (1) The visibility is greatly improved; (2) the minimum quantity of anæsthetic is required; (3) there is no nasal congestion and the blood-pressure in the head is considerably reduced; (4) there is a remarkable absence of shock.

I recommend the following anæsthetic technique: Induction by ethyl chloride and ether, followed by intratracheal ether maintained by electric motor, the insertion of post-nasal plugs, together with a breathing tube in the mouth well surrounded by gauze packing, and finally a sterile towel placed over the airway and fastened at the back of the head.

Intratracheal anæsthesia has two distinct advantages: The danger of inspiration of blood is avoided, and considerably less anæsthetic is required to keep the patient anæsthetized.

Operative Technique (demonstrated by the epidiascope).—The incision is commenced in the centre of the unshaved eyebrow and is carried downwards midway between the bridge of the nose and the inner canthus of the eye, along the lateral groove of the nose, round the ala nasi to the centre of the upper lip, which is divided vertically. The incision is then carried through the mucous membrane of the mouth parallel with the alveolar margin, the cheek being reflected outwards. The periosteum on the inner side of the nose and around the orbit should be carefully raised. The cheek flap should be protected by a gauze pad soaked in tincture of benzoin. The front wall of the superior maxilla and the lateral wall of the nose are removed to expose the growth. The palate when not involved may be left intact, but in many cases it may be necessary to remove a portion of it. Extensions of the growth are then followed up. In all cases I freely remove the floor of the frontal sinus, and lay the duct freely open. The entire ethmoid should be removed together with the anterior wall of the sphenoid and the cavity examined. Lastly the mesial wall of the sphenoid and the upper part of the septum should be searched for any extension of the growth to the opposite side of the nose. It is common to find extension of the growth through the posterior wall of the antrum into the fat of the pterygo-maxillary fossa, and here recurrence is most likely to be found. Considerable hæmorrhage may occur from the internal maxillary artery, but in the upright position the vessel is easily secured and ligatured. After irrigation of the whole area the cheek flap is carefully replaced and sutured into position, the periosteum of the inner side wall of the nose being separately sutured, since this is the site in which the skin incision most often breaks down. Certain questions in connexion with the technique must be considered:—

(1) Should the mouth incision be left unsutured? The advantage is that it gives facilities for irrigation of the cavity and inspection for any recurrence.

(2) Is it always necessary to open the frontal sinus? With increasing experience I feel justified in opening the frontal sinus in all cases; in many, growth is unsuspected and yet present, and in others pus and polypi are there, and a continued discharge of pus into the cavity retards recovery.

(3) Is the frontal incision better than the incision below the eye or through the inner canthus of the orbit? In my opinion the frontal incision is better as it obviates oedema of the lower lid and it gives a good exposure when the eye is retracted outwards.

(4) Is it necessary to remove the glands of the neck? It is my practice to wait and see. In most cases the glands of the neck are not involved by the disease.

(5) Should the external carotid be tied as a preliminary to operation? This seems unnecessary when the patient is operated upon in the upright position.

(6) Is a preliminary tracheotomy advisable? In my opinion, no; intra-tracheal anaesthesia having done away with the necessity for it.

Post-operative Treatment.—The incision is covered with gold leaf and after twenty-four hours no further dressing is applied. All cases should be subjected to X-ray treatment for at least six months.

Result.—The operative mortality is very low. In the forty-five cases in which I have operated two deaths have occurred. In the first case, in which the operation was performed in the recumbent posture, the patient died within a few hours as the result of inspiration of blood. In the second case the patient died of gangrene of the cheek flap, ten days after operation, following ligation of the external carotid.

Recurrence of the disease, which occurs with diminishing frequency with greater experience, is always due to incomplete removal. Where an operation has been done and recurrence has taken place, the right course is to re-open the wound and search for and remove it completely and not, as one is inclined to do, put the case down as hopeless. Unlike malignant disease in other parts of the body the recurrence is far less serious and more easily dealt with than the original growth.

Deformity following the operation need be very slight or *nil* if the palate and teeth can be left intact. If the palate has to be excised a denture must be employed and the mouth impression taken before operation, and a hollow obturator fitted into the cavity left by the removal of the growth to maintain the cheek and lip in position. There is then hardly any alteration in the contour of the face.

Conclusion.—I consider the above technique to be sound in surgical principles and flexible enough in outline to cover all growths of the air sinuses and of the superior maxilla. I unhesitatingly condemn excision of the superior maxilla for growths involving the palate and alveolus only, as it involves an unnecessary removal of the side wall of the nose and of the floor of the orbit. On the other hand, for a growth of the antrum it is utterly inadequate and and leaves extension of the growth into the frontal and sphenoidal sinuses untouched. I hope this operation will soon be a relic of the past. In surgical work in this sphere a sound surgical technique based upon a wide and intelligent knowledge of the anatomy of the air sinuses with their variations and their abnormalities is required.

Sir WILLIAM MILLIGAN (President)

said that Mr. Woodman attacked these growths in a very thorough manner; it had been a revelation to him (the President) that it was necessary to do such extensive operations. He was particularly interested in the remark as to the extension of the growths to the frontal sinus. Amongst all the cases which he had had in the last five years at the Royal Infirmary, Manchester, in only one—carcinoma of the antrum—had there been, so far as he knew, extension to the frontal sinus. From what had been said, cases might have been overlooked. He had not opened and examined the frontal sinus in his cases, because he had had no reason to suspect it was involved. He asked for opinions as to the posture the patient should be in during the operation; the parts were very much more accessible when the patient was seated in a chair than when lying down, and hæmorrhage more easily dealt with in the sitting position. One of Mr. Woodman's fatal cases occurred before he adopted the sitting posture—the secondary pneumonia, no doubt, being due to blood having entered the air passages.

Another point was as to whether or not it was desirable to tie the external carotid artery. His practice had been to do so, as he felt there was a greater freedom from hæmorrhage. He had not seen sloughing of the flap as a result.

Mr. Woodman had referred to the recent treatment of these growths in the Mayo Clinic by means of a red-hot poker; but in the days of Celsus that was the method employed. A speculum was used very similar to the one used now—the poker being passed through the speculum, and the growth burned away.

He thought it would be generally agreed that some other operation should be done before resorting to the extreme procedure of excising the upper jaw. Moreover, it was an incomplete operation for the purpose, for it often failed to accomplish what it was intended to effect. He was inclined to think that the technique followed by Mr. Woodman would go a long way towards abolishing that particular operation.

Mr. W. STUART-LOW

supported Mr. Woodman in not ligaturing the external carotid artery. He was surprised to learn that growth had been found in so many cases to have extended to the frontal sinus. It had not been his (Mr. Stuart-Low's) practice to open it, yet his patients had recovered. He joined in the condemnation of excision of the upper jaw for these cases. He was in favour of the canine fossa route in preference to the facial operation, because a repetition of the operation was often required; and this, when done through the facial scar, led to bad cosmetic results such as were seen in some of the patients shown that day, with large permanent openings in the face leading into the nose and antrum. By the antral route all risk of facial blemish was avoided. He recommended vaccines to lessen sepsis, sloughing, and fætor, which were the accompaniments of these cancer cases; the swabbing of the raw surface with chloride of zinc, and post-operative application of X-rays.

Mr. J. F. O'MALLEY

remarked that until recently the treatment of malignant growths of nasal accessory sinuses fell to the lot of the general surgeon, and were usually classified amongst tumours of the upper jaw. The condition was rarely detected until there had been extensive invasion of orbit, palate, and face.

Up to 1916, when Sir StClair Thomson published his paper on "Moure's Lateral Rhinotomy Operation," he had taken a depressing view of these cases; since that date he had operated upon four cases—three sarcomata, one carcinoma—by this method. Two of the sarcoma cases were still doing well; the third, a myxo-sarcoma, had a slight recurrence, which was being treated by radium, and he hoped to show the case later on. The carcinoma case was a failure, and died a few months later; he could not get beyond the limits of the disease, possibly because the operation was not extensive enough.

Mr. W. M. MOLLISON

said his experience had been in seventeen cases only, three of them sarcomata. The carcinomata were mostly basal-celled—one was columnar, one spheroidal, one squamous. He had carried out operative technique only, and was guided in his incision by the position and extent of the growth. If it was antral, he employed a Ferguson's incision, but not always going completely through the lip. If it was ethmoidal, Moure's incision gave very good approach to the fronto-ethmoidal region, and the operation left practically no scar. He followed, more or less, the technique which Mr. Woodman had described, removing tissue in each direction, including, if necessary, the floor of the orbit, paying particular attention to the malar region—in which recurrence usually took place—and going right back through the ethmoid and exposing the sphenoid. He did not agree that the frontal sinus was often invaded by growth, though that sinus was always suppurating; there was pus in all the sinuses, even if there was no growth. In only two cases did he find growth penetrating the frontal, and in two the sphenoidal sinus. Intratracheal ether was essential in these cases, since blood did not pass into the air passages. Only one of his patients died from shock two days after operation—a female, aged 80. She had extensive growth, and it was necessary to remove her palate, which rendered the prognosis worse. If the palate could safely be left behind, there would be rapid recovery, and no operative shock. He had found recurrences much sooner than Mr. Woodman's remarks would lead one to expect. In only one of his (the speaker's) cases was there absence of recurrence after eight years, the average freedom from recurrence after the operation being about a year. In one case of carcinoma of the ethmoid it was necessary to remove the whole ethmoid, and, while this was being done, the dura mater was damaged, and there was an escape of cerebro-spinal fluid. He applied carbolic to the torn dura mater, and the patient made a good recovery. He advised ligaturing the carotid in these cases, since the bleeding was less than when it was not ligatured. He had not found subsequent sloughing of the flaps, except when the growth was very near the skin of the face.

Mr. NORMAN PATTERSON

said he was much impressed by the technique suggested by Mr. Woodman. He (Mr. Patterson) made a practice of tying the carotid in every case, and he had never had serious sloughing of the flaps. It greatly limited the bleeding and made the operation much easier, for the tumour could be more readily defined. He did not regard opening the frontal sinus in every case as the correct treatment. Some growths were limited to the lower part of the antrum, and in some cases the orbital plate and the ethmoidal cells were not involved. Under these circumstances it would be a mistake to open the

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frontal sinus, and there was always the risk of implanting malignant cells in the tissues. In one case he had performed an extensive operation on the antrum and ethmoid, and a malignant growth subsequently developed in the frontal sinus. In some cases one could not get beyond the limits of the tumour; he then curetted out all the growth he could and afterwards used the diathermy button. When the floor of the nose was not involved, and a portion of the hard palate had to be removed on account of the disease having invaded the antral floor, it was best to make the incision through the palate to one side of the mid-line, so as to leave the incisor teeth. This was more important in the case of women. He had seen cases in which the soft palate had been torn away, although not diseased; that was a mistake. An artificial roof to the mouth could be supplied, but not a functioning soft palate. He always used intratracheal ether. He thought nearly all sarcomata and endotheliomata should be subjected to some form of ray treatment, either radium or X-rays, or a combination of both, before the patient was submitted to an operation. Many sarcomata would almost melt away under ray treatment, but carcinomata, especially epitheliomata, did not, as a rule, respond at all to it.

MR. DOUGLAS HARMER

reported on fifteen cases of epithelioma of antrum, two cases of columnar-celled carcinoma of ethmoidal region and one case of spheroidal-celled carcinoma of outer nasal wall involving antrum. Inoperable cases were not included. Males, ten; females, eight. Under 40, two; under 50, two; under 60, three; under 70, nine; under 80, two.

Seven cases of endothelioma. Males, two; females five. Under 40, one; under 50, one; under 60, two; under 70, two.

Two cases of sarcoma. Females, two; under 45.

Total cases, twenty-three, with two deaths: one from meningitis and one from septicæmia after radium. The low mortality was due to performance of preliminary laryngotomy and plugging of pharynx which prevented blood getting into air-passages. These figures should be compared with Butlin's results, which showed nearly 30 per cent. mortality from operation. With very vascular tumours the question of preliminary ligature of the external carotids should be considered.

Of the eighteen cases suffering from carcinoma and treated by excision only two were known to have lived for more than three years without a recurrence. Of the seven cases of endothelioma treated by the knife one had remained well for five years, when a second operation was performed, and no recurrence occurred for five more years. This patient had then been treated by radium two years previously and was still living. A second case had had an early recurrence after removal of the maxilla and glands of the neck, but had lived for eight more years after treatment with radium. In the other five recurrence had taken place within one year of operation, but the patients' lives were prolonged with radium treatment.

Conclusions.—The importance of early diagnosis could not be too strongly emphasized. On the other hand, localized growths which had been freely excised often recurred rapidly *in situ* because the wound had been reinfected at the time of the operation. There was no evidence that this accident could be avoided by removal of the entire maxilla, and whenever possible a partial excision was preferable, e.g., Moure's operation. In cases of carcinoma simple excision of the jaw had not given satisfactory results. His (Mr. Harmer's) best cases had been those which were treated by excision followed by diathermy and radium.

The Mayo Clinic reports¹ (G. B. New, 1920) quoted results of the treatment of eighteen cases by soldering irons and radium, three of which were dead, two had extensive recurrence and ten were well for eight to twenty-eight months. The writer concluded that two advances had been accomplished by the method of the Clinic, first, the elimination of an operative mortality, and secondly, a marked decrease in the percentage of cases showing recurrence.² Radium alone was of little value for carcinoma and only retarded the disease. Endothelioma also showed a great tendency to recur although the growth was often encapsuled. Tumours of this nature should be treated either by radium followed by excision where necessary, or by excision, diathermy and radium. Sarcoma should be treated by radium in the first instance, or by diathermy and radium. After treatment by diathermy or radium it was often necessary to operate for removal of sequestra. Later, a plastic operation might be necessary to repair deformity. To prevent recurrence it would seem advisable to keep all these cases under X-ray treatment for one to two years. The rare cases which were complicated by involvement of the glands seldom responded to any form of treatment.

Mr. Harmer said he did not agree with Mr. Woodman's views on recurrence. He considered a recurrence always a very serious matter, and the prognosis in any form of operation thereby made worse.

Mr. A. J. M. WRIGHT

suggested that something might be done in the way of preventive treatment, particularly of carcinoma of the nose and accessory sinuses. He had been impressed by having had, during the last six months, three cases of carcinoma involving the antrum and ethmoid, in all of which there was a clear history of old-standing chronic suppuration. That might be a frequent precursor of cancer in this region, as it was known to be so in other parts of the body. Had other members noticed the same thing? If so, it constituted a strong argument for dealing thoroughly with chronic suppuration of sinuses. He supported Mr. Harmer in advocating laryngotomy in these cases.

Mr. WALTER HOWARTH

said that some of these malignant tumours were very slow-growing and amenable to operation, while others were of very rapid growth and soon recurred. He agreed with Mr. Patterson as to the great value of irradiation of sarcomata before operation. Though carcinomata were supposed not to be amenable to radium, he had had a case of extensive carcinoma involving the antrum and ethmoid and side of the nose, apparently hopeless, and it disappeared under radium treatment as if by magic, as in the case of round-celled sarcoma. Therefore the fact of a growth being squamous-celled carcinoma was not necessarily a contra-indication for preliminary irradiation. He practised Moure's modified incision, with extensions as required by the particular case. He was opposed to the set operation of removal of the upper jaw, as it gave a very poor approach to the seat of disease, i.e., to the ethmoid and back of the nose. He had not had time to make a statistical survey of his cases, but he could say that his best cases had been those of round-celled sarcomata. In one such case, operated upon by this method, the patient was alive after four years. Another patient, a case of chondro-sarcoma, was still alive five years after operation.

¹ *Collected Papers of the Mayo Clinic* (1920), 1921, xii, p. 797.

² *Ibid.*, p. 796.

Mr. E. D. D. DAVIS

said that, in view of present-day knowledge, the only successful treatment of malignant disease of the nose was complete excision, therefore an early diagnosis was essential. This Section could render valuable assistance by promoting early diagnosis. He operated with the patient in the semi-recumbent position. He now used intratracheal ether, but in his first few cases he had performed laryngotomy. The patients undergoing laryngotomy did not make such a quick recovery, and the shock of operation was greater. He considered ligaturing the external carotid unnecessary, and it made no difference in the amount of hæmorrhage. The growth must be thoroughly exposed and freely excised irrespective of anatomical structures and, if necessary, the eyeball should be sacrificed. He did not see how thorough exposure could be obtained by the antral route, particularly as some of the carcinomata were adherent to the eyeball and invaded the floor of the orbit.

His experience with radium and X-ray applications had been very unsatisfactory. Radium had been advocated for vascular sarcomata, and he agreed that after exposure to radium such a tumour would rapidly disappear, but it would return just as quickly. He had exhibited such a case, a man, now dead, who had been exposed to 500 mg. of radium, but the sarcoma returned. He had yet to hear of the disappearance of a malignant growth by radium treatment in which the patient had been free from recurrence for more than two years. The only hopeful course was early diagnosis and complete excision.

How soon was it safe to operate after X-ray and radium exposure?

Sir STCLAIR THOMSON

limited his remarks to the Moure's operation of lateral rhinotomy introduced by Moure (Bordeaux), and the results he (the speaker) had obtained. With a series of lantern slides he showed that one lateral incision from the glabella down to the side of the ala nasi, but without entering the nostril, was sufficient to gain free access to all the accessory sinuses. In his cases the frontal sinus was never invaded, though the fronto-ethmoidal cells as well as the sphenoid were frequently diseased. Another reason for thinking that the frontal sinus was rarely attacked was that in recurrences—which were only too frequent—the frontal sinus was seldom involved. He referred to his article published in the *Lancet* for May 13, 1916, and said that the patients in two cases there described and illustrated were still alive and well, and absolutely free from recurrence. The first case was one of endothelioma of the ethmoid and antrum, operated on twelve years ago. The second was an epithelioma of the antrum and ethmoid, operated on ten years ago. Both cases were in ladies and the scar was hardly perceptible. In neither case was there any glandular infection, the carotid was not tied, and there had been no treatment by X-rays, radium or vaccines. In view of such a record he thought that surgery need not yet give way to the red-hot poker!

Mr. HERBERT TILLEY

thought the procedure recommended by Mr. Woodman was particularly useful for the more extensive cases. In his last twelve cases he (the speaker) had approached the growth from underneath the lip and cheek and turned up the latter; this gave extraordinary room and a clear view of the antrum to the floor of the orbit, as well as of the ethmoid cells and sphenoidal sinus. On conclusion of the operation the cheek was replaced and one or two stitches inserted

in the mucous membrane; the patient did not appear to have undergone any operation. He had never ligatured the external carotid in these operations and he favoured preliminary laryngotomy. He operated with the patient in the semi-prone posture.

Mr. A. J. HUTCHISON

asked whether radium had any effect on vision. The patient he exhibited that day had had slowly failing vision on the affected side, but following application of the radium he immediately became blind in that eye.

Mr. JOYCE (Reading) (introduced by Mr. WOODMAN)

spoke of the success with which Mr. Woodman had operated upon a relative of his with bilateral disease, and he had been much struck by the clear exposure obtained, and the slight accompanying hæmorrhage controlled by ligaturing the bleeding points. The patient was under the anæsthetic three hours thirty-five minutes, the operation having taken three and a quarter hours. Only quite an inconspicuous scar resulted.

Dr. N. S. FINZI

said the whole question of the ray treatment of malignant growths depended on giving to every cell of the growth a lethal dose of whatever rays were being used. That dose varied in the case of each kind of growth, and this was the reason of success with sarcoma, and not with carcinoma. The lethal dose for round-celled sarcoma was less than for spindle-celled or myxosarcoma; hence the best results from rays were obtained in round-celled sarcoma—indeed, for those cases he thought ray treatment should replace surgery. In epitheliomata the results from rays were worse than for spindle-celled sarcoma and endothelioma.

Another factor which affected the treatment of these cases was that of sepsis. These growths were all septic at first. It did no harm to give an aseptic growth considerably more than the lethal dose, provided one did not set up infection. There was great harm in giving more than the lethal dose to a septic growth, and failure to cure was the result. He referred to the Erlangen treatment, a modification of our methods of using the X-rays. It aimed at getting a sufficient dose of highly-penetrating rays to every cell of the growth, and the latest methods aimed at sterilizing septic growths first, starting off with the introduction of copper ions and doing a very extensive ionization of the whole ulcerating surface. Next day an intense measured dose of rays was given, with the aim of giving every cell a lethal dose. The irradiation was repeated in six weeks, if the blood condition permitted it; for a heavy radiation damaged the blood-cells considerably, and a second repetition in another eight weeks was often advisable.

Treatment of recurrences was not so satisfactory as the treatment of primary growths which had been untouched by surgery, as surgery damaged the blood and lymph supply to the area; and, perhaps, the patient's resistance was less at the time the recurrence took place. Still, even in recurrences radiation gave relief, and the growth might disappear for a considerable period.

Intensive X-ray exposures precluded operation for a month or so afterwards, as those exposures damaged the skin considerably. He did not think radium affected the eyesight directly; he was often treating cases of rodent

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ulcer quite close to the eye; in only one case had he seen any effect on the retina, and that was merely transitory. Radium attacked the more highly specialized cells much less than the primitive cells; hence, as one would expect, the retinal cells were about the last to be attacked by it. Damage might result from the swelling caused by the radium in a growth in close proximity to the eye or optic nerve.

Sir WILLIAM MILLIGAN (President),

in summing up the discussion, said members seemed, on the whole, to favour the tying of the external carotid, though it was not absolutely necessary. The general opinion was that these growths did not extend usually into the frontal sinus, though pyogenic infection of that sinus was common. Of twenty-three cases of his own in only one was there definite extension to the frontal sinus.

There was a difference of opinion as to the value of the laryngotomy tube and intratracheal ether; he had been surprised at nobody having mentioned Kühn's intubation tube, as he had found it very useful in these circumstances; he favoured either using this tube or performing a preliminary laryngotomy.

He thought surgeons were not sufficiently in the habit of irradiating the tissues beforehand, as well as after the operation. He was sure it was important to remember what Dr. Finzi said as to studying the kind of growth and trying to get in the particular lethal dose.

There was also considerable difference of opinion as to what was the best method of approach; also whether the incision should be as extensive as used by Mr. Woodman or as that introduced by Moure. The disease in question was one which would be fatal unless thoroughly dealt with; hence there must be free access, and, provided life could be saved, disfigurement was a secondary matter. He admitted that Moure's lateral rhinotomy gave a wonderful view, but not so good as that from a combined Killian's and Ferguson's operation.

Mr. WOODMAN (in reply)

claimed that he had great regard for leaving the minimum of blemish after the operation, but it should always be remembered that in these operations the first consideration was for the life of the patient. If the subsequent suturing were done carefully, and followed by applications of X-rays and massage, good cosmetic results would ensue.

Scarcely any members had expressed agreement with him as to opening the frontal sinus; but if it were systematically opened, it would be found to be diseased in 90 per cent. of cases, though not with malignant growth—in two of his cases that sinus was full of growth. Many contained polypi and pus, and these were factors which probably preceded malignant disease. Such growth did not extend through the forehead, but downwards, and appeared at the inner angle of the orbit, where recurrence was frequently seen.

If malignant disease was to be successfully attacked, why not, in these cases, open and examine each one of the sinuses *seriatim*?

He had never irradiated before operation, but he could understand its advantage. He always applied X-rays afterwards. He did not think those who had tried intratracheal ether would go back to laryngotomy. Ether was of great advantage to the patient, was rapidly thrown off, it had no effect on the kidneys, and was not a protoplasmic poison; whereas after chloroform there was often acidosis.

Section of Laryngology.

President—Sir WILLIAM MILLIGAN, M.D.

Papillomata of Larynx.

By FREDERICK SPICER, M.D.

PATIENT, a male, aged 46. Was previously shown at a meeting of the Laryngological Society in 1898 (twenty-four years ago). After several operations extending over four years he was completely cured and remained free from trouble until four years ago when the growths reappeared.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) suggested removal of as much as possible of the growth by the indirect method, followed by irradiation of the area. He showed a laryngeal apparatus he used for irradiation of the larynx in such cases. After tracheotomy, the radium tube, or its emanation, was placed *in situ*, and left there for from twenty-four to thirty-six hours, according to the severity of the case.

Mr. NORMAN PATTERSON asked whether the President had experienced sloughing of cartilage after the application of radium in such cases. He had had one case in which very severe sloughing occurred. He also asked what was the dose of radium advisable in these cases.

Sir JAMES DUNDAS-GRANT reminded members of the beneficial effect of applications of alcoholic solutions of salicylic acid after removal of the growths by instrumental means.

Mr. G. W. DAWSON referred to the advantages of the galvano-cautery. In one case he had had of diffuse papillomata spreading over the larynx, removal by forceps caused violent reaction; since then he had used the galvano-cautery, with much better results.

Mr. C. A. PARKER inquired whether in these cases radium was applicable to children, and, if so, the length of time it could be safely left in position.

Sir WILLIAM MILLIGAN (President) (in reply) said he thought sloughing of cartilage was not a great risk if the amount of radium employed was reasonable and exposure not overdone. It had not occurred in any of his cases. For a soft structure the dose of radium need not be large, but in an old standing case larger doses were advisable, because of the thickening of the submucous tissues. He appreciated the value of salicylic acid, but rarely had recourse to it since he had used radium. The cautery was also useful.

Papilloma of the Right Laryngeal Ventricle, with Blood Cyst of Vocal Cord.

By JAMES ATKINSON, M.B., C.M.

PATIENT, a female, aged 49, first seen March 1, with increasing hoarseness one year. A smooth, rounded, bluish-red swelling concealed the anterior third of the right vocal cord. Seized with Mackenzie's forceps, by the indirect

method, the cyst collapsed and a small amount of blood exuded. A week later the voice had become clear and resonant. Protruding through the right ventricular orifice a small, reddish, firm-looking tumour was now seen, which disappeared into the ventricle on full adduction of the cords. Following two unsuccessful attempts at removal, owing to the tumour slipping away from the forceps and out of sight, the forcep blades were introduced sideways into the ventricle, and the growth, attached by a narrow pedicle, was removed.

DISCUSSION.

Sir WILLIAM MILLIGAN (President), whilst congratulating the exhibitor on the skilful way in which the growth had been removed, questioned the necessity of its removal if causing no symptoms.

Mr. D. L. SEWELL inquired if there was any previous injury to the larynx to account for the onset of hoarseness.

Dr. IRWIN MOORE suggested that this tumour might possibly be an angeio-fibroma. In his recent review on "Angeiomata of the Larynx," he had classed blood cysts under atypical cases. In the present case there might be some relationship between these two tumours, i.e., a dilated blood-vessel (cyst) and a papillomatous growth developing later into an angeio-fibroma. If so, it was fortunate that it had been removed in its early stage.

Dr. KELSON thought there was only one growth which originated from the ventricle and was partially removed at the first operation. He considered that increasing hoarseness for one year was a sufficient reason for removing a growth, and that in this case the procedure was more than justified.

Mr. CYRIL HORSFORD thought the first tumour was a submucous hæmorrhage accompanying the original tumour in the ventricle. He asked whether the patient had increasing hoarseness as an explanation of the hæmorrhage.

Mr. ATKINSON replied that in consequence of a year's hoarseness, he had removed the ventricular growth because of its liability to increase in size. The cyst had no connexion with the ventricular tumour. There was no history of previous injury to the larynx.

Report by Professor S. G. Shattock, F.R.S.—Microscopic examination shows the tumour to be a soft fibroma of the mucous membrane; the delicate connective tissue which constructs it, and which is moderately rich in cells, being directly invested with stratified squamous-celled epithelium, without any intervening capsule, as are the minute fibromata of the cutaneous corium. The tissue is fairly well supplied with capillaries and larger thin-walled vessels, but no hæmorrhage has occurred into it, either recent or past.

Intrinsic Epithelioma of the Larynx shown after Laryngo-fissure.

By Sir STCLAIR THOMSON, M.D.

PATIENT was previously shown before the Section on December 2, 1921,¹ with an infiltration of the left cord. A laryngo-fissure, with removal of the left thyroid ala, was performed on December 3. The growth proved to be a squamous epithelioma. Patient was sitting out of bed the next day, out for a walk on the fourth day, and returned to Yorkshire on the eleventh day.

¹ *Proceedings*, 1922, xv, p. 10.

DISCUSSION.

Sir WILLIAM MILLIGAN (President), having seen this operation performed, said he was impressed with Sir StClair's technique. Many members had performed the operation without removing the thyroid ala, and he asked in what proportion of these cases Sir StClair had not removed the cartilage, and how the after-histories compared with those in which the cartilage had been removed. He asked this because it was very desirable that the Section should be given a lead in this matter. He (the President) had had several cases in which he had not removed the thyroid ala, and the patients had been free from the disease for many years. Recently he had seen a patient on whom he had performed laryngo-fissure five and a half years ago without removing the ala, and there had been no recurrence until three months ago. Re-operation had shown that the thyroid ala was involved by the disease.

Mr. NORMAN PATTERSON reminded members that the partial removal of the thyroid ala had been introduced by Dr. Lambert Lack.

Mr. A. J. M. WRIGHT said some operators removed the thyroid ala with the growth; others elevated the growth from the cartilage, and then removed the ala. It appeared to him better to remove the growth and cartilage *en masse*, and he would like to hear opinions.

Mr. HERBERT TILLEY said he could recall five cases alive at least ten years after he had performed laryngo-fissure. If the disease was recognized early, he considered it was unnecessary to remove the ala, as the growth had not then extended deeply from the surface of the cord towards the thyroid cartilage. But if during the operation a deeper involvement was evident, the cartilage should be removed with the growth. He would be largely guided as to procedure by the rapidity of the growth and involvement of the surrounding area. He referred to a case of malignant disease of the larynx of eight years' standing which had been seen successively by Sir H. Butlin, Sir Felix Semon, and Sir Charters Symonds, before the patient came to him (the speaker). The former observers doubted its malignancy, but, on operation, the growth had all the appearances of epithelioma both macroscopic and microscopic.

Mr. F. H. DIGGLE said that in some cases the cartilage was involved and had to be removed. If removed, and recurrence took place, it was the perichondrium which was generally affected, and it was difficult to remove from that site. He asked Sir StClair Thomson what had been the percentage of recurrences in his cases since he (Sir StClair) had begun removing the ala.

Mr. ARCHER RYLAND remarked that apart from the importance of eradication of the whole disease in these cases, there was the question of laryngeal patency to consider in connexion with the removal of the thyroid ala. It had been his experience in examining these cases after operation to find that in those instances in which the ala had been left intact, there was nearly always an undesirable degree of laryngeal stenosis, but when the ala had been freely excised, an excellent air-way resulted. This fact alone seemed to him a sufficient reason for removal of the thyroid ala.

Mr. E. D. D. DAVIS maintained that if the thyroid ala was excised, better access to the seat of operation was obtained—also the growth could be removed more freely and any bleeding point more easily secured. The thyroid ala, if left stripped of its perichondrium, was a source of sepsis and occasional necrosis.

Dr. W. HILL, referring to the patient mentioned by Mr. Tilley, said it was improbable that a case which had lasted eight years was malignant all the time. He knew of one patient treated by radium who survived six and a half years, also of another who lived five and a half years without any treatment. The rate of growth of malignant disease of the larynx varied greatly, and it was slowest in those sites which were isolated from the lymphatic supply. Again, in the larynx there was no tendency to early secondary infection through the lymphatics.

48 *Tilley: A Rare Bony Tumour of the Left Tonsil*

Sir STCLAIR THOMSON (in reply) said he did not in his early cases remove the thyroid ala, thinking that if this was done, the side of the larynx would collapse, and that this would be followed by stenosis. But since he had removed the ala, a much freer glottis resulted. In the first thirty cases he did not remove the ala; in the last twenty he had removed it. It had been suggested that the ala, if left, acted as a barrier against the spread or recurrence of the disease; but he thought it was the perichondrium, and not the cartilage, which might limit the growth. A non-vascular piece of cartilage left after removal of the perichondrium must take weeks, even months, to granulate over smoothly. Removal of the ala gave more room at the operation, a larger glottis afterwards, and, he thought, a better voice; and there was quicker healing and less sepsis. If recurrence did take place, he did not think a second laryngo-fissure was of any use; a laryngectomy offered the only hope for the patient.

A Rare Bony Tumour (Compact Osteoma) of the Left Tonsil

By HERBERT TILLEY, F.R.C.S.

MISS T., aged 30, consulted me last February on account of a swelling in the region of the left tonsil which had been present as long as she could remember. Her chief symptom was pain at the base of the tongue, on the left side, caused by that organ rubbing against a "rough spot" on the swelling.

Examination revealed a swelling the size of a large walnut which occupied the region of the left tonsil and was covered with smooth normal mucous membrane except for an area the size of a threepenny-bit on its anterior surface. This was of a bluish-grey colour and felt like bare cartilage. The tumour was hard and only slightly movable on digital examination. The tone of the patient's speech was like that of a sufferer from quinsy.

On March 6, and under general anaesthesia, I made a vertical and transverse incision through the mucous membrane covering the tumour and enucleated it intact without difficulty and with so little bleeding that no ligature of vessels was necessary. The patient made an uninterrupted recovery. The voice lacks resonance because of the loss of tissue and wound contraction involved in the removal of the tumour. Posterior rhinoscopy shows that the lower half of the circumference of the cartilaginous portion of the Eustachian tube is absent, a condition possibly due to absorption by pressure of the upper end of the tumour. The tumour has been photographed, drawn, sectioned, examined and reported on by Mr. Howard Mummery.

(The specimen, drawings, sections, &c., were exhibited.)

Report by Mr. Howard Mummery.—The first impression was that it was an odontome. Examination, however, showed that it was pure, hard, dense bone of very close texture, and containing no dentine. Sections of the capsule showed the presence of bone and of cartilage.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) said he had never seen any case like the present one, and thought that the tumour represented vestigial remains in connexion with one of the visceral arches.

Mr. TILLEY mentioned that Sir John Bland-Sutton said that in his experience he had never seen anything similar, and thought that the small hard nodule on the specimen suggested a tooth, and therefore it might be an odontome. He (the speaker) thought that it might be ossification of cartilage from the third branchial cleft. The



FIG. 1.—From the tonsil, half of the ivory-like osteoma and viewed from the outer aspect. Above it, is shown half of a much smaller lens-like mass of bone of similar structure. The corresponding flat surfaces are not perfectly smooth, nor are they polished; and have clearly not directly articulated with one another. The lesser was probably formed independently, and was at one time separated from the other by a thin intervening layer of connective tissue. (Natural size.)

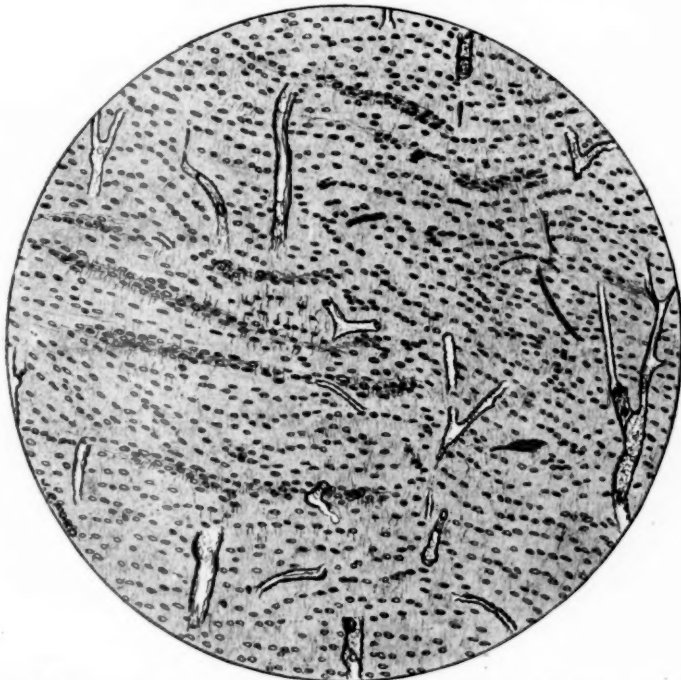


FIG. 2.—A microscopic section of the larger tumour made after drying of the latter. The tumour consists throughout of dense osseous tissue produced in closely applied lamellae. The structure is perforated by a certain number of branching canals. Two-thirds objective. From a preparation by Mr. Howard Mummery. The section was made by means of a thin circular saw, on the electric lathe, and afterwards ground down.

The above description of the specimen and section are by Professor S. G. Shattock, F.R.S.¹

¹ Now included in the Museum of the Royal College of Surgeons of England. The other half has been placed in the Pathological Museum of University College Hospital.

nearest approach to this specimen was seen in the islands of cartilage and bone in tonsils described by Mr. Wyatt Wingrave in 1898.¹

Dr. IRWIN MOORE considered that the case was practically unique. The first case of the kind in which bone and cartilage were found was recorded in 1898. Other cases observed later consisted of small islands of bone or combined bone and cartilage. He believed that no bone tumour as large as this had previously been recorded. The transformation of cartilage into bone had been observed in the tonsil, not only in adults, but in children. The notes of this case showed that the lower half of the circumference of the cartilaginous portion of the Eustachian tube was absent. The process of the tonsil being in close relation and dorsal to the first branchial cleft, which formed the Eustachian tube, suggested the probability that the tumour originated from a portion of cartilage forming the Eustachian cushion which had become isolated in the closure of the branchial cleft and had later been converted into bone.

Sir JAMES DUNDAS-GRANT suggested that Professor Hobday might throw light on the case since horses, sheep, and goats had extraordinary osseous growths in connexion with the temporal bone, usually aberrant tooth structures.

Mr. M. VLASTO mentioned that he had at the present time under his care a young woman with a hard swelling occupying the region of the left tonsil. He proposed enucleating the tonsil by dissection with the hard substance enclosed. Was there any reason why Mr. Tilley had not enucleated the tonsil in this manner?

Dr. W. HILL suggested that from the position of the tumour the term epitonsillar, or palatal was more applicable to this case.

Mr. TILLEY (in reply) said the patient had informed him that he (the speaker) had seen her previously at the age of 8, and he advised that the tumour should be left alone. The tumour was situated above the tonsillar fossa, and he was only prepared to say it was "in the region of the tonsil." The partial loss of tissue of the palatal arch was not due to the operation but was caused by the tumour.²

Malignant Disease of the Soft Palate; Removal by Simple Excision; Preliminary Ligature of the External Carotid Artery.

By ARCHER RYLAND, F.R.C.S.Ed.

MALE, aged 59. First seen February, 1922, complaining of a growth in the throat for fifteen months. Examination showed a neoplasm of the right soft palate, extending mesially as far as the middle line, entirely confined to the right half of the soft palate. Palpation showed deep induration for some little distance into the substance of the left velum. An area of healthy uninvaded tissue intervened between the growth and the hard palate, and between the growth and the right fauces. There were no palpable glands.

Microscopical section of a portion removed showed "An endothelial sarcoma, or a lymphosarcoma: extremely malignant."

Operation: Ligature of the right external carotid artery. Excision of the whole of the soft palate. Enucleation of the right tonsil.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) exhibited an instrument given to him by Dr. Reik (Baltimore) for temporary compression of the external carotid artery. Though the result in the present case was very good, he wondered whether a dose of radium would not have been useful.

¹ *Lancet*, 1898, ii, p. 750.

² A further investigation and report upon this specimen by Professor S. G. Shattock, F.R.S., will be included in a paper on "Cartilage and Bone in the Tonsil," by Dr. Irwin Moore, which will be published later in the *Journal of Laryngology and Otology*.

Mr. WALTER HOWARTH considered that removal by the diathermic cautery knife would have been much better and that excision of malignant growths of the mouth by the knife should be given up in favour of the diathermic cautery. He had had cases of recurrence following the removal of the original tumour by the knife, but when the diathermic cautery was employed there had been no recurrence over a long period. He would show some cases at the next meeting.

Mr. NORMAN PATTERSON pointed out that the patient exhibited had an enlarged and very hard gland on the right side of the neck. In these cases he advocated removal of all the glands on both sides of the neck, whether they were obviously affected or not.

Mr. E. M. WOODMAN was of the opinion that if ligaturing the external carotid was considered necessary in this case, it should have been done on both sides. He asked if the exhibitor had a scheme for the plastic repair of the palate, since something of the kind was very desirable. No mechanical appliance seemed to help these cases to any extent. He suggested that by turning the muscular tissue in from the pterygoids, some kind of mobile palate could be improvised.

Mr. E. D. D. DAVIS said he had kept in touch with five cases in which he had removed the greater part of the soft palate for epitheliomata. The local result was excellent and there was no recurrence, but secondary growths had occurred in the cervical glands on both sides in the interval between the mastoid and angle of jaw, and so high up that they could not be reached. He had been in the habit of using the clamps Dr. Irwin Moore employed for the thyroid isthmus in laryngo-fissure, and the soft palate could then be removed with very little hæmorrhage. In two cases those clamps were in the way, and so he excised the growths without them and yet there was but little hæmorrhage; he simply secured the bleeding points with forceps, and stitched mucous membrane over the cut edges. He did not think ligature of the external carotid made any difference to the hæmorrhage. He had seen a patient with an epitheliomatous ulcer on the lateral wall of the nasopharynx bleed to death though the common carotid was tied.

Mr. ARCHER RYLAND replied that although in this case he ligatured the external carotid artery, events showed this to have been unnecessary. If the necessity arose in future cases, he would favour temporary clamping. There was, in his experience, one objection to diathermy where precise excision was needed, though, perhaps, appearing a trivial obstacle to others, namely, the marked interference with the sense of touch due to the weight or dragging of the connecting wires of the apparatus. For this reason he had excised with the ordinary knife in this case and thought he had some grounds for satisfaction at the result. In reply to Mr. Woodman, he did not contemplate doing any plastic operation for the restoration of the soft palate, for the result of any such procedure must necessarily be very uncertain, but he expected that it would be within range of the dental surgeon's skill to supply the patient with a suitable artificial velum.

Foreign Body in the Nose; Two Cases of Impaction of Bickerton's Style in the Nasal Fossa.

By HAROLD KISCH, F.R.C.S., and ARCHER RYLAND, F.R.C.S.Ed.

Case I.—H. K., adult female. The style had been in position for twenty-four years and had caused little inconvenience. She came to the hospital, however, because lately there had been some soreness about the eye and the epiphora had increased. The style could not be felt lying within the nose. An ophthalmic surgeon, it was stated, had attempted to remove the instrument and had failed. Operation: It was found necessary to make an external incision. The sac was opened and the style easily removed. It had slipped a short distance down the duct. Recovery was uneventful.

Case II.—A. R., adult female. The instrument had been inserted into the lacrymal duct six months before the patient was seen. It has since caused very considerable trouble. An ophthalmic surgeon had made an unsuccessful attempt at removal. The patient has had distressing nasal symptoms, discharge and discomfort, but has not attributed these to the presence of the foreign body in the nose. Recently she has been under frequent treatment for her "nerves" and for "neurasthenia." On anterior rhinoscopy, the body was easily recognized and removed. Moderation and then total relief of all symptoms followed. The "neurasthenia" entirely disappeared, and with it all necessity for further "nerve" treatment. It was notable that her former appearance of worry and ill-health was rapidly followed by one of cheerfulness and vigour. These facts are mentioned because the case affords rather a striking instance of the influence of a nasal affection on the nervous system and general mental balance.

Foreign bodies exhibited.

Endo-bronchial Mirror.

Shown by IRWIN MOORE, M.Ch.

AN adjustable magnifying mirror for employment with the bronchoscope in the direct examination of the lateral lobe bronchi. Especially applicable for examination of the right upper lobe bronchus (since it is out of the direct line of vision) in cases of impaction of foreign bodies.

Endo-laryngeal Mirror.

Shown by IRWIN MOORE, M.Ch.

AN adjustable magnifying mirror for the direct laryngoscopic examination of the subglottic region. As stated by members at the meeting of this Section on November 4, 1921 (opinions of Sir StClair Thomson, Dr. W. S. Syme, and others), difficulty has been experienced in the past of ascertaining by direct or indirect laryngoscopy the seat of origin of subglottic growths, or the extension of malignant disease below the vocal cord. This mirror, adapted from Michel's post-nasal mirror, can be adjusted to any angle, and may be passed through a direct endoscopic tube between the vocal cords; and the subglottic region—which has hitherto remained hidden, since it is outside the direct line of vision—may be thoroughly examined.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) thought these mirrors were capable of considerable usefulness, but there would be a difficulty in focussing upon such a small mirror and at such a distance.

Dr. IRWIN MOORE replied that the mirrors were supplied with powerful magnifying glass and the endo-laryngeal mirror he recommended should be used through an ordinary short (Killian) tube, inserted between the vocal cords. A deep anaesthesia under open ether was necessary. He had not yet had the opportunity of using the bronchoscopic mirror. It was designed for search of a foreign body, such as a pea, impacted in, e.g., the upper right lobe bronchus, the only indication of the presence of a foreign body being pus emanating from a bronchus out of the direct line of vision.

Carcinoma of the Maxillary Antrum ; Moure's Operation of Lateral Rhinotomy ; Recurrence ; Death.

By IRWIN MOORE, M.Ch.

A SPECIMEN of the right side of face, previously exhibited on November 1, 1918,¹ and recently re-dissected and mounted by Professor S. G. Shattock, F.R.S.²

Is now exhibited to show the usual site of extension of malignant disease of the antrum and ethmoid.

Patient was shown at the meeting of this Section on February 2, 1917,³ three months after operation. Recurrence observed three weeks later, and re-operation (February 22, 1917). Patient died, November, 1917, one year after first operation.

DESCRIPTION OF SPECIMEN BY PROFESSOR S. G. SHATTOCK, F.R.S.

Portion of the right side of a face, with part of the frontal bone, showing an extensive gap in the situation of the upper jaw, &c., following a lateral rhinotomy operation; and indicating the subsequent destruction of various bones by the extension of a columnar-celled carcinoma which arose in the antrum.

The section of the skull has been made somewhat to the right of the middle line. The wound of the operation rapidly healed, but six months later, recrudescence of the disease took place, the wound was reopened, new growth removed, which was rapidly followed by sloughing away of the soft parts, and further extension of growth to the orbit and zygomatic fossa, necessitating removal of the eyeball for proptosis.

Death occurred one year after the operation.

In the divided surface of the skull may be recognized the anterior part of the sphenoid with portion of the right internal carotid artery: the bone is replaced and the position of the sinus occupied by compact resilient new growth.

The neoplasm extends anteriorly into the orbital plate of the frontal, which it has replaced as far as a cavity which lies immediately behind the tabular portion of the bone. There is no proper frontal sinus in the orbital roof, or in the bone above, which appears unnaturally thick by reason of its absence.

The space shown is probably a fronto-ethmoidal cell.

The patient, a woman, aged 62, had complained of gradual swelling of the upper part of the right cheek for some weeks. On puncturing and washing out the right antrum the washings contained a considerable quantity of pus and on opening through the incisor fossa it was found full of growth. The major operation was carried out a few days later (November, 1916) by Moure's method.

¹ *Proc. Roy. Soc. Med.*, 1919, xii (Sect. Laryngol.), p. 24.

² This specimen is now included in the Museum of the Royal College of Surgeons.

³ *Proc. Roy. Soc. Med.*, 1917, x (Sect. Laryngol.), p. 60.

Dr. IRWIN MOORE explained that in this case apparently no frontal sinus was present. The growth had extended backwards through the right ethmoid region to the sphenoid, and later advanced forwards and upwards involving the remaining ethmoid cell (seen in the specimen), which evidently had taken the place of the frontal sinus. Though the wound was reopened and attempts made to get beyond the growth, the disease extended out of reach of operative procedures. No radium was employed in this case.

**Carcinoma of the Nasopharynx; Operation (July 14, 1916):
No Recurrence (1922).**

By IRWIN MOORE, M.Ch.

PATIENT was shown at the meeting of this Section on November 3, 1916,¹ and again on June 1, 1917.² No radium treatment was employed, and it is now nearly five years since operation. Full notes and illustration of the growth were supplied with the case.

**Sarcoma (small-celled) of the Right Maxillary Antrum; Moure's
Operation of Lateral Rhinotomy (Sept., 1916); Recurrence,
Pre-aural Gland (March, 1917); Margin of Orbit, Right
Inner Canthus (July, 1918); Right Breast and Axilla (Aug.,
1919); Growth dispersed by Radium.**

By IRWIN MOORE, M.Ch.

THIS case was formerly shown at meetings of this Section, November 3, 1916,³ and November 1, 1918,⁴ and is again exhibited to show the satisfactory results of two and a half years' radium treatment. Full notes and photographs were supplied with the case at the meeting.

TREATMENT BY RADIUM.

Further report from the Radium Institute following notes of case already published in the *Proceedings*:—

July, 1917: Swelling in right parotid region first observed—slowly increasing. No pain.

March 19, 1918: Proptosis, right eye. Enlargement (4.3 by 5 cm.) of right pre-aural gland. Shot-like gland, right extremity of hyoid. Plate applicators of radium applied at bridge of nose, and a tube inserted high up in nostril containing 160 mgr., screened with 1.5 mm. of lead—applied for sixteen and a half hours distributed over four consecutive days.

April 10, 1918: Pre-aural gland now size of pea. Radium 100 mgr., same screening—twelve hours, over four days.

¹ *Proc. Roy. Soc. Med.*, 1916, x (Sect. Laryng.), p. 32.

² *Op. cit.*, 1917, xi (Sect. Laryng.), p. 1.

³ *Proc. Roy. Soc. Med.*, 1916-17, x (Sect. Laryng.), p. 29.

⁴ *Op. cit.*, 1918-19, xii, p. 21.

July 16: Gland now shot-size. Further diplopia. Induration (new formation) of right inner canthus, and extending to margin of orbit. Almond-shaped mass between globe and orbit. Eye more prominent. Radium 75 mgr. —twenty-five hours over five days.

October 31: Vision failing gradually last two months, and is now only 6/60. Fundus is normal, so that reduction in visual acuity is probably due to pressure on, or undue stretching of, optic nerve. Diplopia two months ago, lasting only a short time.

January 16, 1919: Induration of inner canthus increasing. Eye more over to right.

January 27: Vision in right eye almost *nil*. More marked proptosis. Paresis of external rectus, left eye. Though induration less, disease evidently advancing base of brain. Radium treatment same as before.

March 17: Now no induration around orbit. Complete paralysis of both external recti. Fullness right temporal fossa. Radium treatment same as before.

May 5: Fullness greater, temporal fossa. Paralysis as before. Operation scar healthy, and antrum clear of any growth.

June 23: Signs as before. Now much headache. Radium treatment as before.

August 18: Paralysis of external rectus left side less. Edema of outer surface of right eye. Small hard lump in right breast, and enlarged glands in axilla. Radium treatment as before.

October 6: Ocular paralysis changed. Now marked ptosis and weakness of left internal rectus, and superior oblique. Right eye still proptosed. Pain not so severe. Radium treatment as before.

November 24: Fullness and tenderness in left temporal region. Paresis of ocular muscles passed off. Still radium treatment as before.

January 26, 1920: Fullness in right temporal region. No pain. Radium treatment as before.

April 13: Still fullness in right temporal region. No ocular symptoms or signs. Radium treatment as before.

July 12: Eyes normal. No induration detected. No pain. Still fullness in right temporal region. Still hard nodule in breast and axilla. Radium treatment as before.

October 11: Slight weakness of right external oblique. Fullness in right temporal fossa disappeared. Radium treatment as before.

January 12, 1921: Only obvious signs present—slight ptosis of right upper eyelid, and slight proptosis left eye.

In all, thirteen applications of radium have been given between March 19, 1918, and October 11, 1920, and since then no further treatment has been necessary, the growths having apparently been dispersed.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) referred to the satisfactory results obtained and remarked that although radium had been used no bone necrosis had followed.

Dr. IRWIN MOORE (in reply) said it was interesting to note that during 1919 the growth extended rapidly, and caused nearly total blindness in the right eye, accompanied by paralysis of the external recti and superior oblique. Dr. Lynham (Radium Institute) reported that the growth was evidently extending deeply towards the base of the brain. As a result of the applications of radium the sight was restored. Patient has had no treatment since 1920, and at present there is no evidence of further activity of the disease.

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Removal of a Fibroma of the Larynx by Mackenzie Forceps and Nasal Snare.

By E. D. D. DAVIS, F.R.C.S.

PATIENT, a male, aged 52, complained of hoarseness of fourteen days' duration, following a bad cold and cough. A pale, smooth-looking polyp, about the size of a large cherry-stone was seen attached to the right ventricular band by a broad pedicle. Several attempts were made to remove the polyp by the indirect method, using Mackenzie and Dundas-Grant forceps, but the attachment was too firm in spite of forcible traction.

Owing to the perfect tolerance of the patient, manipulations were greatly facilitated. At Mr. Vlasto's suggestion, a Mackenzie forceps was slipped through the wire loop of a Lermoyez nasal snare, the polyp was pulled upwards with the forceps and, under my observation and direction through the laryngeal mirror, Mr. Vlasto slipped the snare over the base of the polyp, and a piece of the ventricular band and the polyp were easily removed.

The patient, and the polyp with microscopy and instruments, are shown.

DISCUSSION.

Sir STCLAIR THOMSON referred to warnings of the earlier laryngologists as to the dangers of employing an intra-laryngeal snare, since it might become jammed, or the wire caught in a growth, so that neither the snare nor the growth could be removed. With Mackenzie's forceps he himself had always succeeded with the toughest of tumours.

Dr. W. HILL described an experience of such a difficulty as Sir StClair Thomson mentioned, in which he had to free the snare and get the growth away with the aid of a knife.

Dr. DONELAN said he was against the use of the snare in the larynx, but if he did use it he would have by his side a wire-cutter, with which he could release the snare from the growth if the snare became jammed or caught.

Mr. A. J. HUTCHISON spoke of a case in which he had surrounded a growth in the anterior commissure of the larynx with a snare; the snare got caught and he had great difficulty in removing it, and only succeeded after pulling on the snare with considerable violence.

Sir JAMES DUNDAS-GRANT and Mr. A. WYLIE regarded the snare as a valuable instrument, especially for pedunculated growths in the anterior commissure.

Mr. E. D. D. DAVIS (in reply) pointed out that in the snare he used the tube had no bridge at its distal extremity, so that the wire could be drawn up into the tube and was bound to cut through a polypus. He used a wire of No. 5 gauge.

Three Post-mortem Specimens of Acute Septic Œdema of the Larynx.

By E. D. D. DAVIS, F.R.C.S.

THE first two specimens, marked 803 and 805, were obtained from the Museum of Charing Cross Hospital, and the complete histories cannot be found. Both specimens are twenty-five years old.

No. 803 is labelled acute laryngitis and œdema of the glottis in an adult male, who died soon after admission and his case was diagnosed as diphtheria. The

post-mortem report states there was no trace of a false membrane and draws attention to the acute inflammatory redness, œdema, and a superficial abrasion of the mucosa.

No. 805.—Acute œdema with hæmorrhages obtained from a patient who died of septicæmia consequent on gangrenous stomatitis. An emergency laryngotomy had been performed by the late Mr. Stanley Boyd.

The third specimen was obtained from a child, aged 15 months, for whom the exhibitor was asked to do an emergency tracheotomy twenty-four hours before death. The patient had been in the children's ward five months for vomiting and gastro-enteritis, and just before the child's discharge from hospital during the influenza epidemic, it developed tonsillitis, adenitis, and a septic rash suggesting scarlet fever. When first seen by the exhibitor, there was considerable cervical adenitis with a subsiding tonsillitis and a symmetrical superficial abrasion above each tonsil, presumably due to the vigorous use of Mendl's paint. The case was not considered to be serious. The organism obtained from the swab was *Streptococcus brevis*. At the second examination, a week later, there was obvious laryngeal obstruction with slight cyanosis. The tongue was œdematous and the under surface in the position of the rub of the incisor teeth was covered with a yellowish exudate. Ulceration of both sides of palate above the tonsils covered by greyish exudate. Satisfactory examination of larynx impossible. Immediate tracheotomy with local novocaine anæsthesia. Patient died of broncho-pneumonia of a few days' duration twenty-four hours after tracheotomy.

Carcinoma of Deep Pharynx removed by Lateral Pharyngotomy.

By WALTER HOWARTH, F.R.C.S.

MRS. M., aged 45, complained of discomfort on swallowing, with some pain, for the last few months. When seen (September, 1921), bismuth fluid passed without apparent obstruction, but the bismuth capsule could not be swallowed. Œsophagoscopy revealed a shallow ulcerated growth on the posterior wall of the deep pharynx, which extended almost into the œsophageal opening. Portion removed was reported by Professor Dudgeon to be squamous-celled carcinoma. Lateral pharyngotomy a few days later. The growth was found to extend somewhat more laterally and deeper than was thought, so that thorough removal entailed the complete severance of the œsophagus from the pharynx. In spite of the fact that there was a gap of about 1½ in. an end-to-end anastomosis was made between the upper end of the œsophagus and the large irregularly cut edge of the deep pharynx. Pharyngeal musculature and other available tissues were used to reinforce the sutured area.

Convalescence was not uninterrupted. The wound in the neck healed normally and the tracheotomy tube was removed on the tenth day, but fifteen days after the operation the patient collapsed severely and passed a pint of dark blood per rectum and another half pint next morning. The œsophageal feeding tube was then removed. The mæna diminished and disappeared, but a few days later some lung symptoms developed on the right side, and a purulent pleural effusion was aspirated and found to contain

streptococci in pure culture. As a result of the coughing and expectoration, the tracheal wound broke down again, but healed finally in a few days.

At the present time, five months after operation, solid food can be swallowed, but only with great care and some difficulty. Laryngoscopic examination shows no sign of the operation, as this was below the field of vision. Frothy mucus is seen in the postericoid region. This may be due to stenosis consequent to the operation, or may be due to impaired neuro-muscular co-ordination. Future œsophagoscopy will, however, decide this.

DISCUSSION.

Sir WILLIAM MILLIGAN (President), commenting on this difficult operation, observed that the exhibitor might be congratulated on the successful results obtained. There remained some slight stenosis, but it might be only fibrous. A very valuable suggestion in the record of the case was that of the retention of the feeding-tube for considerably longer than was the general custom. He had himself been in the habit of removing it after five or six days, but he was now sure it was too soon. There was much still to be done in regard to these operations, and Mr. Howarth had shown how much was possible.

Mr. E. M. WOODMAN referred to the œsophageal tube as the most vulnerable in the body. He thought some further details of this case would help the Section, and encourage members to persevere in their efforts. He asked in what position the head was placed following the end-to-end anastomosis of the œsophagus. Also, how the head was fixed, whether in a mechanical appliance, or by means of a plaster bandage round the neck. Absolute immobility of the œsophagus after suture would be very desirable. He asked, further, what form of suture was used, whether interrupted, or continuous, and what form of external drainage. He (Mr. Woodman) always used external drainage, but had not succeeded in inducing the œsophagus to heal up without leakage.

Mr. TILLEY did not think the symptoms of frothy mucus should be called Jackson's sign; it had been recognized for years by other observers, and Sir Felix Semon had insisted on its significance in cases of post-cricoid cancer. The accumulation of mucus was not infrequent in advanced cases of tuberculous and malignant disease in the pyriform fossæ.

Dr. W. HILL said Jackson erroneously claimed that the frothy mucus was a sign of œsophageal disease, whereas it was also a sign of disease in the deep pharynx.

Mr. HOWARTH (in reply) said he had never had any trouble with the nasal feeding tube in previous cases, but in this case apparently the irritation of the tube gave rise to some bleeding from the gastric mucosa on the fifteenth day and he had had to remove the tube. The patient was not placed in any particular post-operative posture: the neck was very firmly bandaged, and no mechanical appliance was employed. The œsophageal wall was sutured with interrupted catgut mattress sutures. The only drainage was by a Kocher's tube in the lower part of the wound for twenty-four hours.

Double Abductor Paralysis due to Myasthenia Gravis.

By WALTER HOWARTH, F.R.C.S.

THIS patient (male, aged 25) was shown at the February meeting,¹ and it was suggested that the condition was due to a bulbar lesion. The present diagnosis is based on the opinion of Dr. Birley and Dr. Buzzard, who find in

¹ *Proceedings*, 1922, xv, p. 25.

addition to the laryngeal condition, marked loss of sustaining power in arms and legs, difficulty of hanging up his coat owing to dropping of arm, difficulty in walking owing to left knee giving way, extreme weakness of facial muscles in lower half right face, regurgitation of fluids through nose and left palatal weakness, marked weakness of the right serratus magnus with winged scapula.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) said that when the case was previously exhibited he was interested in the possible aetiology. He had excluded bulbar paralysis on account of the patient's age.

Mr. F. H. WESTMACOTT agreed that the condition was myasthenia gravis. In 1913 he saw a military man, aged 31, with very similar symptoms, which came on gradually; and his voice used to fail when he went on parade. Sir David Ferrier diagnosed the case as myasthenia gravis, prescribed polyglandin, and reported that he regarded the prognosis as serious. Patient used to walk twenty miles on a Saturday afternoon, and returned very exhausted. When war broke out, he accompanied his regiment to Gallipoli, where he gained the D.S.O., and later went to Egypt, where he had another attack. He (the speaker) recommended polyglandin again, and patient got well. A feature of the case was that patient had a dropped jaw, and had to hold it up. The disease also affected the muscles at the lower part of the ribs and the diaphragm.

Dr. DONELAN said that ptosis was a prominent symptom of myasthenia gravis, and that was absent in this case; also, the hand-grip was good. The vocal cords were thickened and it was doubtful whether paralysis was present. Without a lesion of the recurrent laryngeal nerve there could be no abductor paralysis and if there was the case was not a myasthenia, which, as far as his recollection went, was not a paralysis at all but impairment due to an infiltration of the muscular fibrillae. A foul discharge was exuding from the back of the nose, and the teeth were bad. He suggested the possibility of congenital syphilis, and recommended Mr. Howarth to reconsider the diagnosis. There might be some malingering.

Mr. E. M. WOODMAN recorded the case of a woman, aged 35, who appeared to have a "functional voice." There was double abductor paralysis. Her heart was flabby and dilated. On screen examination with a bismuth meal, the food was seen to pass quietly across the larynx and down the oesophagus. He sent her to a neurologist, who diagnosed myasthenia gravis, and gave a bad prognosis. He asked whether such a patient was likely to die of septic pneumonia, or of cardiac failure.

Mr. HOWARTH replied that the neurologists made the diagnosis, and he did not feel competent to question it. There was very definite weakness of the serratus magnus and palate, also of the lower half of the face. He knew of one similar case in which there was abductor paralysis of one side, and in which the patient got well; with proper treatment he did not see why this patient should not get well too. He would pass on to the physicians the suggestion to use polyglandin.

Case of Nasopharyngeal Fibroma involving the Left Maxillary Antrum and side of the Nose; Removal by Moure's Lateral Rhinotomy.

By NICOL RANKIN, M.B.

PATIENT, a boy, aged 15, first seen August, 1921, complaining of obstruction of both nares of gradual onset during the previous three months. On examination of the left naris a firm reddish tumour was seen which entirely filled the air-way posteriorly and had pushed the septum so much over to the

right that breathing through that side was impossible. The tumour protruded through the left choana and almost filled the left half of the nasopharynx. In the nasopharynx it presented a greyish-pink appearance, and was firm on palpation.

On August 30, 1921, I removed the growth through the nose. It appeared to arise from the lateral wall of the nasopharynx high up. Bleeding was very profuse and the nasopharynx had to be packed. As a result of the operation patient could breathe freely through both sides of the nose, and the nasopharynx appeared free of all growth.

In February this year the growth had partially filled up the left side of the nose, so that he could not breathe through it; there was also considerable swelling of the left side of the face. Transillumination showed a dark shadow.

On February 21, 1922, a Moure's lateral rhinotomy was performed. The external carotid was tied as a preliminary measure. The tumour occupied the left side of the nose, the left side of the nasopharynx, and the whole of the left maxillary antrum through the walls of which it extended laterally into the cheek and posteriorly into the spheno-maxillary fissure. No sign of infiltration of bone or other tissues was found. The tumour was lobulated, smooth, and very tough. It required very hard pulling to remove it. Bleeding was steady and fairly profuse but at no time alarming, as at the first operation.

Microscopic section showed that it was a fibroma, some of the tissue suggesting an angioma-tous origin.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) suggested that in a case in which hæmorrhage was likely to be profuse and dangerous diathermy should be employed two or three weeks before the major operation. This greatly reduced the size of the growth and the risks of hæmorrhage.

Mr. NORMAN PATTERSON said that as the result of his experience with radium he was inclined to give up cutting operations. In a boy under his care, who had a growth extending into the zygomatic and temporal fossæ, the only cutting he did was to remove a piece for microscopic examination. Radium and X-rays were applied, and the growth entirely disappeared. He had seen other cases cured by irradiation.

Mr. RANKIN (in reply) said that his case simulated one recently exhibited by Mr. O'Malley, which also proved to be a fibroma.

Case of Papilloma (shown at the December Meeting).¹

By GEORGE W. BADGEROW, C.M.G., F.R.C.S.Ed.

PATIENT, a male, aged 33. After being shown at a meeting of this Section in December, 1921, a thyrotomy was performed on February 8, and the right vocal cord, together with the anterior portion of the left cord—which was involved—were removed. Microscopic section by Dr. Hunt showed it to be a papillomatous growth.

Sir JAMES DUNDAS-GRANT said the opinion expressed in December was that at present the growth was of potential malignancy rather than actual.

¹ See *Proceedings*, 1922, xv, p. 14.

Foreign Body (Toothplate) in the Œsophagus.

By F. H. WESTMACOTT, F.R.C.S.

PATIENT, a male, aged 42. Admitted to Manchester Royal Infirmary, September 9, 1920. Tooth-plate swallowed during the night; kept in Observation Ward till morning. X-ray located plate in œsophagus, at about level of seventh cervical vertebra.

Œsophagoscopy (September 9, 1920): Plate not discovered. Case sent for second X-ray. Plate located as before.

Second œsophagoscopy at 7.45 p.m. on same day: Plate seen at level of seventh cervical vertebra. Small piece was removed; rest of plate fixed and not removable.

Third œsophagoscopy (September 10, 1920): Plate seen, impacted and immovable.

Patient died late on evening of September 10. Post-mortem showed acute mediastinitis.

Mr. WESTMACOTT remarked that dental surgeons, when making and fitting small dentures, took a serious responsibility, especially in the case of patients with high-arched palates. The denture in the present case was found exactly to fit the lumen of the œsophagus, and was so surrounded by œdema that it could not be felt. On attempting to remove it with forceps, a piece of the vulcanite plate broke away, and before Dr. Irwin Moore's cutting forceps arrived the patient died. He doubted even if they had been at hand whether the patient's life could have been saved, as the denture had pierced the œsophagus and set up acute suppurative mediastinitis, from which the patient died thirty-six hours later.

Solitary Papilloma of the Left Vocal Cord, showing early Carcinomatous Transformation.

By E. A. PETERS, F.R.C.S.

(PATIENT was shown at a meeting of the Section on December 2, 1921, under the title of "Solitary Papilloma of the Infracordal Region.")

The following notes of the case, including the discussion, have not been previously published in the *Proceedings* :—

Male, aged 36, complaining of bronchitis and dyspnoea for some time. A papilloma is seen attached to the under surface of the anterior attachment of the left cord, and flaps to and fro between the cords during respiration. A constriction is seen at the point where the cords grip the papilloma.

DISCUSSION.

THE PRESIDENT did not think the growth was infracordal, but was on the surface of the cord. In this opinion he was supported by Dr. JOBSON HORNE and Mr. HOWARTH.

It was agreed that it should be described as "above the cord."

At a meeting of the Section this day (May 5) a microscopic section of the tumour after removal was exhibited. In discussion it was agreed that the section should be submitted to Professor Shattock for his expert opinion.

62 Peters: *Solitary Papilloma of the Left Vocal Cord*

Histological Report by Professor Shattock, F.R.S.—Whilst the growth is for the most part simple, the section shows at one spot an intruded plaque of epithelium in the connective tissue of the mucosa; the epithelium in question includes proliferating groups of cells indicative of an early carcinomatous transformation. On the under or deeper side of this, there is some extravasation of blood, recent, and older, as proved by the presence of free pigment. There is, moreover, blood pigment in the fibrous tissue a short way further onwards where the epithelium is not carcinomatous. Some of the free surface is denuded of epithelium, but there is no neoplasm at these spots, nor is there any on the general epithelial surface where this is intact.

Mr. ALEXANDER TWEEDIE, F.R.C.S., gave a Demonstration of "Apparatus for Olfactory Tests, based on the Work and Suggestions of Professor Zwaardemaker, of Utrecht."

DISCUSSION.

Mr. J. F. O'MALLEY said he had been disappointed in regard to tests for smell. If tests were made with substances giving off active odours, patients were unfamiliar with them and could not distinguish one from another. What the patient considered smelling was being aware of the presence of a pungent vapour.

Mr. TWEEDIE, at the suggestion of the President, agreed to give, at a future date, a further demonstration of the tests.

FURTHER CASES.

Cases shown at previous Meetings of the Section, and deferred for completion or further investigation, will be published in a Supplement.

Section of Laryngology.

President—Sir WILLIAM MILLIGAN, M.D.

Epidiascopic Demonstration of a Method of Transillumination of the Tonsil *in situ*.

By IRWIN MOORE, M.Ch.

THIS method—introduced by Dr. Thomas French, of Brooklyn—by means of which in conjunction with the tonsilloscope (a tonsil microscope) the tonsil of health may be differentiated from that of disease, is brought to the notice of the Section with a view to investigations being made by members as to its practicability and efficiency.

Instrument for Electrolysis of Tonsils requiring Removal.

Shown by A. R. FRIEL, M.D.

THE principles, the dosage and the advantages of this form of treatment were described in the *Lancet*, August 20, 1921, p. 417.

Portion of Left Styloid Process.

By A. J. M. WRIGHT, F.R.C.S.

REMOVED from left tonsillar region of female, aged 30. Symptom was discomfort in the left side of the throat, particularly on swallowing. Noticed for a few weeks only.

DISCUSSION.

Dr. J. DONELAN inquired how Mr. Wright arrived at his diagnosis.

Mr. WRIGHT replied that he exhibited the specimen partly as a contrast to Mr. Tilley's case shown at the last meeting, and partly because he had had to deal with two cases in the last six months in which such a condition gave rise to symptoms. Sir StClair Thomson had, in his text-book, stated that though it was an anatomical curiosity, symptoms were never caused by it. But he (Mr. Wright) found that a considerable number of cases had been recorded in which symptoms occurred, and that they had been entirely relieved by removal of the projecting process. This was the second case he had seen. A skiagram in the present case did not help the diagnosis.

Case for Diagnosis.

By G. W. DAWSON, F.R.C.S.Irel.

PATIENT, a boy, aged 18. Fifteen months ago he was sent from eye hospital with pronounced lacrymal obstruction and swelling, left side. There was a mass of hard glands under the left jaw and the left nostril was completely blocked.

Operation, April, 1921: Much cheesy material in ethmoid region. Reported tubercular. Wassermann positive. Transillumination clear. The swelling in canthus quickly subsided; so also did the glands. Mist. biniodid. given.

January, 1922: Swelling over the upper part of maxilla. Transillumination now dark.

April, 1922: Caldwell-Luc operation. Antrum lined with diseased membrane. External swelling opened up from the inside. It appeared to be in the ascending process of superior maxilla and consisted of putty-like white material, examination of which was negative. Wassermann negative except at first examination. Is this tubercular or congenital syphilis?

DISCUSSION.

Sir WILLIAM MILLIGAN (President) said much had been done intranasally in this case, but he was struck by the boy's excellent teeth, which did not suggest congenital syphilis as a cause. From the description it appeared to be a case of ethmoiditis caseosa.

Dr. W. H. KELSON and Mr. A. J. M. WRIGHT agreed with this opinion, the latter considering that the external expansion of the nose favoured this view.

Sir JAMES DUNDAS-GRANT reminded members that he had shown before the Section more than one case of rhinitis caseosa, and he thought the examination of the putty-like material in rhinitis caseosa under the microscope would be interesting. This was not cholesteatomatous, but consisted of broken-down pus cells.

Mr. J. F. O'MALLEY thought there were two foci, which did not communicate with each other. In 1912¹ he showed before the Section a case with a very hard mass on the upper part of the superior maxilla. Patient, a male, aged 26, was sent to him because he was thought to have antrum trouble. There was nothing the matter with the antrum, and some members diagnosed the condition as sarcomatous. Wassermann reaction was negative. He tried iodides in small doses, but with no benefit. He therefore reflected the lip upwards, and removed a wedge-shaped mass of putty-like consistence. The microscope did not show this to be either inflammatory or gummatous. Later he treated the patient with larger doses of iodide, and the condition disappeared, and therefore he concluded it was syphilitic. He advised large doses of iodide of potassium in the present case to judge of the effect.

Mr. DAWSON replied that he had seen several cases of rhinitis caseosa, and had found that when the caseous mass was removed the condition was improved quickly. He had not observed enlargement of the glands in this condition. The Wassermann reaction was positive in this case, and the patient had been taking iodides ever since.

¹ *Proceedings*, 1912-13, vi (Sect. Laryng.), p. 53.

Epithelioma of Soft Palate and Tonsil, removed with the Diathermic Cautery.

By WALTER HOWARTH, F.R.C.S.

MALE, aged 45, had shallow ulcerated growth on upper pole of left tonsil spreading across soft palate. Microscopic examination proved it to be epitheliomatous. The whole of the soft palate, including both tonsils was excised in one piece (specimen is shown) ten weeks ago. The glands of the neck on both sides were to have been removed but the operation has had to be postponed for a week or two.

Epithelioma of Palate, Tonsil, Tongue and Floor of Mouth, removed in One Piece with the Diathermic Cautery.

By WALTER HOWARTH, F.R.C.S.

M. MCG., MALE, aged 56, sent on to me with a so-called inoperable growth. This was found to extend in the base of the tongue almost to the epiglottis. The mass removed includes the whole of the growth and the posterior two-thirds of the base of the tongue. Glands of the neck were considerably involved and were dealt with at a subsequent operation.

Epithelioma of Palate removed by the Knife: Recurrence in Palate and Lateral Wall of Pharynx excised by the Diathermic Cautery.

By WALTER HOWARTH, F.R.C.S.

A. H., MALE, aged 44. First seen, June, 1917, with an epithelioma of palate. This was excised in the usual way and a block dissection of the glands performed on a subsequent occasion. The patient was kept under observation, and in October, 1918, signs of recurrence appeared. Owing to a misunderstanding the patient did not come into hospital and, when seen again in January, 1919, there was an extensive recurrence in the palate and on the right lateral wall of the pharynx and nasopharynx. This was then excised by the diathermic cautery. There has not been any recurrence during the past three and half years.

These cases are exhibited (1) to show the result when the method is used in an early case; (2) to show the result in a so-called hopelessly inoperable case; (3) to show a typical end-result. This case also serves to emphasize the author's contention that in all cases of malignant disease of the mouth and pharynx the growths should be removed by the diathermic cautery in preference to the knife.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) said the cases and specimens exhibited demonstrated what could be done with the diathermy knife. Mr. Howarth's results were excellent and he had been able to make a clean sweep of the disease. The conclusions at which Mr. Howarth had arrived might well be sifted and discussed

by members of the Section. He (Sir William) had always maintained that there was a great field for diathermy in disease of the mouth and fauces. In many cases which were adjudged inoperable with the knife by general surgeons much good could be effected by diathermy. He had patients who were living in complete comfort to that day whose cases had been declared by surgeons to be inoperable and these he had treated by diathermy.

Mr. W. STUART-LOW said his experience of diathermy coincided with that of Mr. Howarth. He had had a number of cases which he had successfully treated by diathermy, some of which he had exhibited before the Section.

Mr. G. W. DAWSON inquired how Mr. Howarth dealt with the growth when in close proximity to the carotid. He could understand the procedure in cases in which large portions of the tongue had to be dealt with, where there were no large vessels.

Dr. W. H. KELSON inquired whether the cases now shown were fair samples of Mr. Howarth's results, and whether he had any failures or secondary hæmorrhages? In the early days of this treatment one heard of cases in which sudden death followed.

Mr. W. H. JEWELL said he had had one case of collapse and death six hours after operation by diathermy without the patient having regained consciousness. He had an extensive epithelioma of the lateral wall of the pharynx and fauces and the diathermic cautery was only applied superficially to relieve his pain. The patient could only breathe with his head flexed and he was much congested. It was necessary to perform artificial respiration twice during the operation, so that it is questionable whether the diathermy was directly the cause of his death.

Mr. A. J. M. WRIGHT agreed with Mr. Howarth's conclusions, and said that this method represented a great advance and rendered operable some cases which previously were inoperable; it caused less constitutional disturbance than did ordinary operations. Diathermy had some disadvantages, but these were outweighed by the advantages.

Mr. H. V. FORSTER said these cases renewed the encouragement they had received from the President's paper on this subject at Liverpool¹ and before this Section.² He asked whether Mr. Howarth had treated by this means any cases of epithelioma of the pyriform fossa. He (the speaker) had seen several cases in which the disease extended down the lateral wall of the pharynx, and he did not feel encouraged to use diathermy so near the larynx. Cases of mouth and throat cancer, as elsewhere, varied in the degree of malignancy; some cases did well; the wound healed, and the patients increased in weight. He had one case rather wasted, in which a growth of the fauces on the left side involved the upper and lower jaws. Following cauterization the wound healed and patient increased two stones in weight. Although at the operation the glands were dissected out, there was now recurrence in the neck. What was Mr. Howarth's experience with regard to hæmorrhage? At the Liverpool Hospital they had been very fortunate in that respect, for they had not had a severe case of secondary hæmorrhage. In some cases the external carotid was previously tied, in others not.

Mr. NORMAN PATTERSON agreed with Mr. Howarth's conclusions to which he (the speaker) had come some years ago—as to the advantage of diathermy over cutting operations in the mouth and pharynx, whether the condition was early or advanced. He strongly emphasized the necessity for dealing with glands in the neck; they should be thoroughly removed by block dissection either before or after the diathermy operation. Three years ago he had had a male patient, with a small growth involving the palate and uvula, who refused any operation on his neck. Patient did well for three years. There was now an inoperable recurrence in the neck. Again, he had seen another case in June, 1919, of a small growth on the left tonsil. An operation on the neck was refused, and diathermy was carried out. Three months later patient had a large mass in the anterior triangle, and, after much pressure, submitted to an operation. He (Mr. Patterson) dissected out all the glands from the anterior triangle, and sections

¹ *Brit. Med. Journ.*, 1921, i, p. 461.

² *Journ. Laryng. and Otol.*, August, 1921, p. 369.

examined showed typical epithelioma. Three months later the patient had a recurrence in the posterior triangle, and this was removed. Two months ago no sign of disease could be found.

Sir WILLIAM MILLIGAN (President) said that secondary hæmorrhage was probably an exaggerated danger in these cases. If one happened to be operating very close to a large vessel, one would probably ligature the vessel. But his own experience was that secondary hæmorrhage was comparatively rare. In one case he had been obliged to ligature the lingual artery.

Mr. HOWARTH (in reply) said he exhibited the cases to show three typical varieties; they were not carefully selected to show good results, but illustrated the result obtained in each type. With regard to secondary hæmorrhage, he did not think the seat of operation was sufficiently near the carotid to cause anxiety; the arteries one encountered were those in the pharyngeal wall: the ascending pharyngeal and branches of the lingual artery, and, in the tongue cases, the lingual artery itself in the floor of the mouth. The diathermic spark would not coagulate the lingual artery, but if that artery was efficiently tied it did not cause any further trouble. He had never had secondary hæmorrhage of any kind in these pharyngeal, tonsillar and palate cases, and he did not see any reason why it should occur, as the vessels in those regions were not large ones. One should certainly not go near the carotid artery. In answer to Dr. Kelson, he had not had any case of sudden death, and he found patients stood this operation remarkably well, and had very little shock. Chloroform was the anæsthetic of choice; ether could not be employed because of the danger of the spark igniting it. There was practically no pain from these operations in the mouth, a striking contrast to the severe pain on burning a cutaneous surface. The cases healed up under a dirty looking slough, which cleared up in about ten days, leaving a smooth granulating surface, which quickly became a very elastic scar. He had used a modification of the method in many hopeless cases in which one could not expect to remove the growth. In these he removed what he could, and tried to destroy as much as possible of the rest by buzzing the spark into the growth, and even in those cases there had been gratifying results, in the relief of pain and the clearing up of sepsis. In answer to Mr. Forster, he had used it in hopelessly inoperable cases in the pyriform fossa, and he did this through the ordinary tube spatula, with a special electrode, which passed down the tube easily. He always performed a preliminary tracheotomy, because œdema in the region of the arytenoid often followed. In these cases, of course, the treatment was only palliative. Last year he had had two cases in which the growth was removable; he approached the growth by transthyroid pharyngotomy, after the method of Trotter, but instead of removing the growth with the knife, he used the diathermic cautery. He removed the growth satisfactorily, but the result was not a success in either case. The first patient was very intolerant of the nasal feeding tube, and pulled it out on the seventh day, with the result that he died from septic broncho-pneumonia. The other patient progressed well for three days; had no shock, seemed well and comfortable, but died suddenly without any warning from uræmia. In his next operable case, which he could approach through the wall of the pharynx, he would again excise with the diathermic cautery. He agreed with everything Mr. Patterson said about removal of the glands in these cases, which he regarded as very important. A complete dissection of the triangles of the neck should be undertaken as soon as possible; the difficulty was to persuade patients to agree when there were no noticeable swellings in the neck. In a previous discussion some objection had been raised to the weight of the cautery apparatus hampering the movements of the operator. He used a home-made instrument (which he exhibited). This consisted of a platinum wire in a glass tube, with an insulation of vulcanite and rubber; it was quite light, and could be used for an hour or more without discomfort.

Case of Epithelioma of the Right Half of the Fauces treated by Diathermy (with Section).

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

WM. E., a middle-aged man, was referred to the Throat and Ear Department of the West End Hospital for Nervous Diseases on April 7 by my colleague, Dr. Hildred Carlill, with a diagnosis of epithelioma of the pharynx; he had had discomfort in the throat for two years, and pain, with inability to swallow solids, for six weeks; there was dense infiltration of the anterior pillar extending along the velum palati nearly to the uvula; in the centre of this there was a mushroom-shaped outgrowth which extended down to the ascending ramus of the lower jaw. He was transferred to the Central London Throat and Ear Hospital, and on April 24 with a diathermic knife I excised the growth as far as possible, and diathermized the portion which was adherent to the lower jaw by means of the button rheophore. The reaction was extremely slight, the pain disappeared, and the patient was able to swallow with comfort in about two days. The diagnosis of epithelioma was confirmed by microscopic examination (section shown), and the patient is free from discomfort. A small flake of bone has been exfoliated, but there has been very little sloughing; the surface has not yet completely cicatrized, and the granulating patches appear to be simply inflammatory.

DISCUSSION.

Sir WILLIAM MILLIGAN (President) asked whether the appearance on the right side of the lower jaw was malignant or inflammatory.

Mr. NORMAN PATTERSON thought the appearance referred to by the President was a recurrence; he himself had had cases like that. The proper course was to remove a piece, have it examined, and, if malignant, diathermize again. It was not always easy to tell whether one was dealing with granulations round a sequestrum or with a recurrence of the growth.

Dr. DONELAN asked whether Mr. Howarth or Mr. Patterson had had any ill results or inconvenience from the use of chloroform.

Sir JAMES DUNDAS-GRANT (in reply) said he had removed a portion of the granulating part, which evidently led down to necrosing bone.¹

Mr. HOWARTH replied that he had had no ill effects from the use of chloroform in these cases. Occasionally when oxygen as well as chloroform was used, there was a minute explosion, and he had noted a smell of chlorine in the mouth.

Case of Tuberculous Ulceration of the Gum of the Lower Jaw, of the Tip of the Tongue and, previously, of the Sublingual Tissues.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

PATIENT, a male, aged 47, first seen by me in September, 1918, complaining of difficulty in talking and swallowing. There was extensive tuberculous ulceration of the sub-lingual tissues. He had previously been under X-ray treatment at a

¹ The piece of tissue proved to be carcinomatous and a further diathermization has been carried out.

general hospital for two years, and at the end of this time was given three months to live. He then came to the Throat Department of Brompton Hospital, and after prolonged treatment by means of the galvano-cautery, and applications of pyoktanin and Lake's compound formalin solution, the tuberculous ulcers in the floor of the mouth healed. He remained free from the trouble till May, 1921, when he was again referred to me by my colleague, Dr. Fenton, on account of tuberculous ulceration of the tip of the tongue, a portion of which was excised; the persistent small spots are now being treated by the galvano-cautery; very recently there has been an extending ulceration of the gums at the site of the lower central incisors; this is being subjected to the same treatment and to local applications of pyoktanin and iodoform.

In 1921 Dr. Fenton reported that the patient had extensive but very chronic pulmonary tuberculosis, mainly in the right lung (tubercle bacilli present in sputum), and that he had recently developed a small tubercular abscess over the lower costal cartilage on the right side, which had diminished after aspiration.

Sir JAMES DUNDAS-GRANT said he proposed to continue treatment, chiefly by galvano-cautery for the penetrating tuberculous ulcer in the gum and alveolar process. The prognosis of tuberculosis in the mouth was so bad, that the mastery obtained over the ulcerations on the tongue was almost more than one could have expected.

Case of Tuberculosis of the Larynx treated mainly by Transnasal Inhalations into the Larynx.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

IN March, 1921, the patient, a young lady, aged 21, had complete loss of voice, with sub-cordal infiltration and a serrated deposit in the interarytænoid space; there was a good deal of expectoration, and tubercle bacilli were found in the sputum. There was also such extreme enlargement of the lingual tonsil that I thought it advisable to remove a little of it; this was carried out first with the galvano-caustic puncture to make it less vascular and then with the lingual tonsillotome; when this had been done her voice recovered to an extraordinary degree, though she was not allowed to use it.

Applications of lactic acid and Lake's formalin compound solution to the subcordal swelling were made at long intervals, and more recently, injections of argyrol and collosol argentum into the larynx. The main treatment, however, consisted in the daily inhalation through the nose into the larynx of one part of eucalyptol in nineteen of oil of sweet almonds, to which was added later a little iodol and menthol.

The voice has now returned, there is no cough and the little sputum obtained from her in May of this year contained no bacilli, the larynx being practically normal.

Sir JAMES DUNDAS-GRANT, supplementing his description, said the transnasal inhalation or injection seemed to have a very beneficial effect. The patient could administer it herself, and he had seen it enter the subglottic region, as he had tinted the substance injected with methylene blue. She was very intolerant of intra-laryngeal treatment, and had been sent away from a sanatorium as incapable of further benefit because there was so much ulceration in the interior of the larynx. The injections were made through the nose while the patient's head was thrown back and breathing was carried on with the mouth open, though without swallowing. At another meeting he would be pleased to demonstrate the method.

Case illustrating very Rapid Advance of Laryngeal Cancer.

By ARCHER RYLAND, F.R.C.S.Ed.

A. M., AGED 47, male. The case is one of very active and malignant laryngeal carcinoma. The history is one of eight weeks only. Although the precise origin of the growth cannot be stated it is certain that the cancer has an extrinsic origin. The voice is only affected by the bulky presence of a large mass of growth above the cords. The neoplasm rises high up towards the upper pharynx and from here a piece was very easily snared for the purpose of microscopical section.

Pathologist's report: "An epithelioma, which appears to be very malignant."

The case is shown for its short history, and its very active and malignant character. The microscopical section is exhibited.

Sir WILLIAM MILLIGAN (President) said he did not suppose much could be done in that case except by symptomatic treatment, including insufflations of charcoal, to absorb the bad odours, which were quite noticeable in this patient.

THE following cases have been referred for later publication until further investigations or completed reports have been submitted:—

H. LAWSON WHALE, F.R.C.S.: "Pathological Specimen: (Papilloma of Nasal Septum) with Microscopic Slide."

Sir JAMES DUNDAS-GRANT, K.B.E., M.D.: "Epithelioma of the Right Half of the Fauces."

Sir JAMES DUNDAS-GRANT, K.B.E., M.D.: "Case of Laryngeal Obstruction of Uncertain Nature. ? Peri-Chondritic."

W. M. MOLLISON, M.Ch.: "Laryngeal Case for Diagnosis."

JAMES DONELAN, M.B.: "Ulceration of Right Tonsil Region and of Glands Opposite."

PHILIP FRANKLIN, F.R.C.S.: "Case for Diagnosis: Growth below Left Cord."

W. H. JEWELL, O.B.E., M.D.: "? Cystic Accessory Thyroid or Thyroglossal Cyst."

Section of Laryngology.

President—Sir WILLIAM MILLIGAN, M.D.

SUPPLEMENT.

FURTHER REPORTS ON CASES EXHIBITED BEFORE THE SECTION AT PREVIOUS MEETINGS, SESSION 1921-1922.

(1) *Cases shown November 4, 1921.*

Foreign Body in Œsophagus.

By M. VLASTO, F.R.C.S.

A FEMALE child, aged 4½, was brought into hospital by her mother four months ago with the history of having swallowed an open safety-pin half an hour before. The child was restless, and screening only could be carried out. It was reported to me that an open safety-pin with the point upwards could be seen at the level of the suprasternal notch. An immediate œsophagoscopy revealed a metallic object in the commencement of the œsophagus. This was seized with Paterson's forceps, but appeared to be firmly embedded. In view of the history, it seemed advisable to defer further instrumentation until a plate had been taken and instruments collected to deal with the situation. Later on in the day the mother came up and related that the object swallowed was not a safety pin but a paper fastener, and this was confirmed by the X-ray plate. The position of the foreign body was seen in the plate to be over the head of left sixth rib, where it has remained ever since. A further examination was made the same night, and on two further occasions; on these last two with the assistance of Mr. E. D. D. Davis. But although the œsophagus and left bronchus were thoroughly searched, no trace of the foreign body could be found.

The two X-ray plates taken by Mr. Coldwell, and the bismuth skiagraph, show the foreign body to be in front of the œsophagus.

There has never been any cough or respiratory distress. The general condition of the child is normal.

The opinion of the Section is desired, especially as to (a) the probable situation of the foreign body; (b) the prognosis.

ii Dawson: *Tumour of Left Side of Neck for Diagnosis*

DISCUSSION.

Sir WILLIAM MILLIGAN (President) said if the foreign body was not now in the bronchus, the only deduction was that it was in the bronchial tree. He suggested further screen examination.

Mr. TILLEY thought the foreign body was in the bronchus. It could not have passed into the mediastinum without producing a fatal result. He advised a bronchoscopic search in association with X-ray screening.

Dr. PATERSON (Cardiff) pointed out the diagnostic importance of an antero-lateral X-ray photograph in such cases and that in this case only an anterior view had as yet been taken. He had seen a case in which a tooth plate remained impacted at the same spot for ten years and was surrounded by fibrous tissue. Death followed attempts by a surgeon to remove it and autopsy showed that it lay between the œsophagus and pericardium.

Dr. IRWIN MOORE commented on the rapidity with which the mucosa in the œsophagus folded over a foreign body, especially in children. He reminded members of a case recorded by Mr. Jewell,¹ in which an impacted coin was seen post mortem to have been nearly completely encysted in fifteen days by the œsophageal mucosa. He asked whether the foreign body in Mr. Vlasto's case had been seen, on screening, to move with respiration.

Mr. VLASTO (in reply) stated that no record was made as to movement of the foreign body with respiration. The position of the foreign body as shown by bismuth skiagraphy was in front of the œsophagus. He would gladly avail himself of Mr. Tilley's suggestion to search the left bronchus again.

Further Report, April 25, 1922.—Patient was seen a fortnight ago, and keeps in excellent health. The foreign body remains in precisely the same position. If anything, it is slightly more towards the left—i.e., further away from the middle line than before. No further instrumentation has been carried out.

Tumour of Left Side of Neck for Diagnosis. ? Epithelioma.

By G. W. DAWSON, F.R.C.S.I.

FEMALE, aged 47, with large hard fixed tumour left side of neck, first noticed a year ago, and only slightly increasing during the last four months. Examination shows a superficial infiltration of the arytenoids, and posterior surface of the epiglottis, which has not changed during the past three months. Wassermann negative.

DISCUSSION.

Mr. STUART-LOW pointed out the advantage of palpation in these cases, a method of investigation which was now somewhat neglected. It enabled one to detect a slight difference in resistance in the pharynx. He regarded the case as an epithelioma.

Sir WILLIAM MILLIGAN (President) agreed that the growth was malignant.

Further Report, April 29, 1922.—The growth proved to be epithelioma, and the patient is now being treated at the Cancer Hospital. The interesting feature of the case is the slowness of the growth.

¹ *Proceedings*, 1915, viii (Sect. Laryng.), p. 108.

(2) Cases shown December 2, 1921.

Case of Sarcoma of the Cheek and Maxilla, with diffuse Secondary Growths.

By E. D. D. DAVIS, F.R.C.S.

Further Report, April 26, 1922 (supplementary to notes published in *Proceedings*, 1921-22, xv, p. 11).—Patient died on February 25, 1922, from secondary growths in the roof of the orbit and in the chest. In spite of massive doses of radium, these secondary growths were extremely rapid.

Case of Laryngeal Web, following Laryngo-fissure for Malignant Disease of the Left Vocal Cord.

By W. H. KELSON, M.D.

Further Report, April 29, 1922 (supplementary to notes published in *Proceedings*, 1921-22, xv, p. 15).—The web looks the same but the voice has somewhat improved. There is no evidence of recurrence of the epithelioma. The web has not, as yet, been treated.

Functional Ventricular Band Phonation, suggesting Tuberculous Laryngitis.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

THE patient, aged about 30, was discharged from the Army and certified as unfit for work, on the suspicion that he was suffering from tuberculosis of the larynx. The main symptom was persistent hoarseness. At first sight there appeared to be extreme inflammatory swelling of the ventricular bands, but on closer examination and the use of inspiratory phonation, the ventricular bands retreated and the vocal cords became quite visible. The separation of the ventricular bands by means of a laryngeal brush induced normal voice production, which has continued ever since to the patient's evident satisfaction.

Further Report, May 10, 1922.—The voice has continued normal. There is no suggestion of tuberculosis.

Persistent Functional Falsetto (Eunuchoid) Voice, suggesting Tuberculosis of the Larynx.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

THE patient, aged about 40, discharged from the Army and also certified as unfit for work, under suspicion of being tuberculous, speaks in a high falsetto voice with little power. This tone is produced by the approximation of the middle part of the vocal cords with imperfect approximation of the anterior and posterior parts. During laryngoscopic examination and also

with inspiratory phonation, a natural tone is produced, but so far has not been permanent.

Further Report, May 10, 1922.—The falsetto tone continues, but it disappears during laryngoscopic examination and the voice becomes normal; the patient is to practise uttering sounds with the handle of a teaspoon pressing on the palate. No further evidence of tuberculosis.

Antro-choanal Polypus of Unusual Size.

By G. W. DAWSON. F.R.C.S.I.

MALE, aged 47, with a large globular, pale-coloured tumour of firm consistence, and freely mobile, filling the nasopharynx and extending downwards into the pharynx. Patient had a similar growth removed twelve years ago. On transillumination the right maxillary antrum lights up normally, whilst the left is abnormally bright.

DISCUSSION.

Mr. O'MALLEY commented on the remarkable tolerance which enabled patients to endure such conditions so long. Three years ago he had a case of a nasal polypus reaching to the arytenoids.

Dr. IRWIN MOORE referred to a growth of similar size in a female patient. The tumour occupied nearly the entire oropharynx, and its lower border could not be seen without firmly depressing the base of the tongue. These tumours were not uncommon. He advised—if the pedicle could be located to the maxillary antrum—that the latter should be opened, and the tumour removed at its origin.

Sir WILLIAM MILLIGAN (President) said it was often stated to be the right course, the first time one dealt with an antro-nasal polypus, to pull it out with forceps, and to trust that it would not recur. He felt that this was very unscientific, and that it was better to make a window in the antrum and remove the base of the growth. In the case shown the inference was that the growth came from the antrum.

Sir JAMES DUNDAS-GRANT agreed that if it was ascertained that the growth originated from the antrum, the antrum should be opened; otherwise the tumour might be only growing from the choanal margin, and opening the antrum was unnecessary. Recurrence indicated opening the antrum.

Mr. T. B. LAYTON said that he had in four cases removed such tumours under a local anæsthetic, pulling them out with Mackenzie's wire *écraseur*, and none had returned. If these growths, when pulled away, included the pedicle arising from the antrum, they did not recur.

Dr. SMURTHWAITE said that he had removed a similar growth without an anæsthetic in the case of a boy aged 15; it hung down below the soft palate, and the patient could not breathe through the nose. The growth, with its pedicle, was 2 in. long and 1 in. broad. There was no bleeding, and the boy made a good recovery. If the growth should recur, he (Dr. Smurthwaite) would probably open the antrum.

Mr. DAWSON (in reply) said he thought the growth originated from the left antrum. He had found it the best way to remove these polypi under a local anæsthetic, and to engage the stalk with a blunt hook and drag on it, and then the growth dropped into the mouth. He was inclined in this case, however, to open the antrum.

Further Report, April 29, 1922.—The growth was removed by first opening the antrum by the Caldwell-Luc method, the pedicle being found attached close to the ostium. The lining antral mucosa had undergone polypoid degeneration. The growth weighed $9\frac{1}{2}$ drams.

Tumour of the Pharynx.

By W. H. JEWELL, O.B.E., M.D.

MALE, aged 62, with aphonia of nine weeks' duration, following a cold and pain in throat for a few days, then expectoration of three-quarters of a pint of blood, but no recurrence; occasional dysphagia. A smooth, round tumour, larger than a haricot bean, is seen in the right pyriform fossa. When first seen, three weeks ago, both vocal cords were congested, and the voice was husky. Two or three enlarged glands can be felt in the right submaxillary region.

DISCUSSION.

Dr. SMURTHWAITE said the growth occupied practically all the right side of the larynx, and the arytenoid joint could not be seen; therefore one could not be certain of the site of origin of the tumour; whether the cord was fixed or impaired in movement. He suggested that the growth was a fibroma.

Mr. A. J. M. WRIGHT said he regarded the growth as epithelioma, and referred to the comparatively great degree of oral sepsis found in such cases. He considered oral sepsis a factor in the causation of extrinsic carcinoma of the larynx.

Sir JAMES DUNDAS-GRANT referred to the short history for the diagnosis of malignant disease, even though the appearance was compatible with it. He suggested an acute localized inflammation, which would perhaps settle down.

Mr. HOWARTH said he considered the growth malignant, and advised endoscopic examination as likely to show its exact limits, and to settle also the question of mobility of the cord.

Dr. JOBSON HORNE asked whether the history of hæmoptysis would not be against the use of the direct method.

Mr. W. M. MOLLISON said he did not doubt that the growth was in the right aryteno-epiglottic fold, but he doubted whether it was attached to the pharyngeal wall. The cord moved. He regarded the condition as epithelioma of the aryteno-epiglottic fold.

Mr. JEWELL (in reply) said there was a doubt as to whether the growth was confined entirely to the pyriform fossa; he believed the aryteno-epiglottidean fold was also involved. He would examine endoscopically as suggested.

Further Report, June 19, 1922.—Microscopic section of a portion proved the growth to be an epithelioma. Shortly after the meeting the patient developed acute lobar pneumonia with delirium; the right lung never cleared up—a fact attributable, according to the radiologist, to secondary growth—but this diagnosis has not been verified. Two months later a low tracheotomy was performed owing to glottic obstruction. The primary growth had increased to about the size of a walnut, and invaded the lateral wall of the pharynx.

Post-nasal Growth.

By J. F. O'MALLEY, F.R.C.S.

PATIENT, a male, aged 14, for the past three months has awakened after a few hours' sleep gasping for breath. He is unable to breathe through either nostril, owing to obstruction from a growth in the naso-pharynx.

DISCUSSION.

Mr. H. V. FORSTER thought the growth was a sarcoma, and advised that a tube of radium should be placed in the nasopharynx. He mentioned a case of nasopharyngeal sarcoma he had seen two years ago, in which two applications of radium proved successful. He referred to a second case in a female patient who looked very ill and jaundiced. The growth was projecting into the oropharynx. He removed a specimen for diagnosis, and fastened a tube of radium behind the posterior border of the nasal septum. Three weeks later the patient was so much improved that the remains of the growth could only just be seen, and the Eustachian cushions were clearly evident. He (Mr. Forster) was keeping this case under observation.

Mr. N. RANKIN said that two months ago he had had a case which much resembled the one now exhibited. He had removed the growth completely and a section showed it was a fibroma. It was growing into the left side of the nose, and had pushed the septum over to the right, so that nasal breathing was prevented. There had been no recurrence.

Mr. T. B. LAYTON said he had had a case which was originally diagnosed as tuberculosis of the lung. The patient, a boy aged 19, was coughing up much purulent sputum, and having attacks of what was considered hæmoptysis. There was a large rounded swelling protruding from below the palate, which he (Mr. Layton) took to be a choanal polyp, and tried to remove with a snare, but on putting the loop round it he found it was impossible to do so as the growth was firmly attached to the posterior pharyngeal wall. It proved to be a carcinoma, and the boy died as a result of the operation for its removal.

Sir JAMES DUNDAS-GRANT said that a great deal depended on the point of attachment of the growth. In the present case there was much necrosis of tissue on the surface, causing an offensive smell, and he agreed that the growth was malignant. He advised treatment by radium.

Sir WILLIAM MILLIGAN (President) said it was a useful plan first to employ diathermy in order to shrivel the growth somewhat and reduce the amount of hæmorrhage at the operation. Diathermy was also a good preliminary to the subsequent use of radium.

Mr. O'MALLEY (in reply) said he saw the patient for the first time the previous day. Pending a more thorough examination he could not say what he proposed to do, but he would keep the President's suggestion in mind.

Further Report, April 24, 1922.—Post-nasal growth proved to be a fibroma. It was removed piecemeal, by a large Luc's forceps, through the right nostril, after resection of the septum and the middle turbinal. Patient seen recently, is doing well, and will be shown at a later meeting.

(3) *Cases shown February 3, 1922.*

Laryngeal Tumour for Diagnosis.

By LESLIE POWELL, M.B.

Further Report, April 26, 1922 (supplemental to notes published in *Proceedings*, vide p. 19).—Acting upon the advice of Sir William Milligan, I performed a tracheotomy and kept the patient under observation for three weeks. The tumour diminished considerably, and all signs of inflammation disappeared, and the patient's general condition improved (partly no doubt owing to his being kept from alcohol). There was then still a small elevation in the same region, but no symptoms except slight huskiness. I then removed his

tube, and he has been much better since. This fact, I think, supports the view of perichondritis, and I am inclined to leave well alone as long as there are no further symptoms.

Case of Palato-labial Dysarthria.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

Further Report, May 10, 1922 (supplemental to notes published in *Proceedings*, 1921-22, xv, p. 20).—During the last three weeks patient has had difficulty in fixing his eyes, otherwise he is *in statu quo*. The ophthalmic surgeon's report will shortly be forthcoming.

Case of Dysphonia approaching Aphonia, simulating Laryngeal Tuberculosis—probably Mucous Patches on Vocal Cords.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

Further Report, May 10, 1922 (supplemental to notes published in *Proceedings*, 1921-22, xv, p. 21).—The white patches have entirely disappeared; the vocal cords are somewhat redder than normal; the voice is quite normal. No evidence of tuberculosis.

Case of Laryngeal Growth.

By W. H. KELSON, M.D.

MALE, aged 64, warehouseman, seen November, 1921, complaining of slight hoarseness. The right vocal cord was found to be immobile, but no swelling was visible. X-rays showed chest normal. When seen again recently, a large swelling was observed in the right arytaenoid region overlapping and concealing the right cord. Wassermann reaction negative; no tubercle bacilli found; no enlarged glands. Iodide of potassium and mercury have failed to improve the condition. The larynx now appears wider than when first seen. Opinions are invited as to treatment.

Further Report, April 29, 1922.—Laryngectomy was proposed, but urgent dyspnoea supervened and tracheotomy had to be performed. Patient became weaker and died of heart failure before further operation. The growth was a squamous-celled carcinoma.

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Section of Medicine.

President—Dr. G. NEWTON PITT, O.B.E.

DISCUSSION ON THE DIAGNOSIS OF GASTRIC ULCER.

Dr. CHARLES BOLTON.

AN ulcer of the stomach appears before us for diagnosis under several different pathological aspects, and it is not surprising therefore that the clinical appearances are variable. As this fact is apt to be lost sight of in discussions on the subject, I propose in the first instance to remind you of these different pathological types.

Acute ulcer exists in two forms :—

(1) As originally formed from the initial lesion, of variable size and sharply punched out. It rarely involves the peritoneum but commonly opens up an artery. These ulcers usually heal well in from three to four weeks, but sometimes with difficulty, almost assuming a chronic appearance.

(2) As a lesion extending in a circular fashion with terraced edges, either penetrating the coats of the stomach in the shape of a funnel and not uncommonly perforating ("acute perforating ulcer"); or spreading more extensively in the mucous membrane forming a large shallow ulcer, the peritoneum and edges gradually thickening and resisting perforation. They are, however, very liable to open up arteries. These extending ulcers may stop at any time and heal slowly in proportion to their size.

Chronic ulcer is a later development of the acute spreading ulcer produced by gradual thickening of the edges and base. The same two types occur. It either assumes the form of a funnel-shaped or large excavated cavity of rounded or irregular shape, or of a flat more or less extensive ulcer. Some of these ulcers eventually heal or partially so, but a large number are quite incapable of healing at all, more particularly so when the base is formed of some structure outside the stomach.

There are three chief means which enable us to recognize the presence of an ulcer :—

(1) By the accidents to which the disease is liable—hæmorrhage and perforation, although the latter does not really enter into this discussion.

(2) By the disorders of gastric function produced by it.

(3) By the recognition of a characteristic deformity of the stomach or by seeing the crater of an ulcer with the X-rays. Such a crater can only be seen in a certain number of chronic ulcers when favourably situated and of a suitable size and shape. It is most commonly seen in connexion with hour-glass stomach.

(1) *Accidents of the Disease.*

Hæmorrhage is the most valuable diagnostic sign of ulcer, because other causes of bleeding can usually be readily excluded, and small losses of blood are always intermittently occurring in ulcer which may be recognized in the stomach contents or, more important, as occult blood in the fæces, in a certain proportion of cases (two-fifths). It may occur at any time during the evolution of cicatrization of an ulcer, and although the blood may be vomited when in any

quantity, it may be entirely passed by the rectum even in fatal cases. The characteristic feature of the bleeding from an *acute gastric ulcer* is a sudden profuse hæmatemesis, or less usually melæna, without previous gastric symptoms and apparently in the midst of good health. A history of previous attacks of a similar nature is common, for acute ulcer tends to recur. The amount of blood lost is commonly considerable, but not invariably so, and an initial small hæmorrhage may be followed after an interval by a profuse one. The patient may not have noticed that melæna has occurred and may seek advice for fainting attacks and anæmia. This is the class of case which may be mistaken for the bleeding that occurs in certain non-gastric diseases—for example in hepatic cirrhosis, anæmia, particularly splenic anæmia, or certain toxæmias, and so on, but by the exercise of due care such mistakes can be avoided.

In a certain number of cases of acute ulcer gastric symptoms are present as a result of concomitant functional disorder of the stomach. Such cases are indistinguishable from chronic ulcer. Another disease with which an inevitable confusion arises is a form of patchy gastritis, in which the mucous membrane over a fair sized area is seen to be swollen and red with bleeding points on the surface, due to rubbing off the surface epithelium, and the mucous membrane readily bleeds on manipulation. Such patients may lose considerable quantities of blood if an inflamed gastric follicle happens to ulcerate into an artery and an acute ulcer results.

The bleeding in *chronic gastric ulcer* nearly always occurs with characteristic pain, in which case the diagnosis of ulcer is established. In all cases with prolonged gastric pain the stools should be repeatedly examined for occult blood, the presence of which would again settle the diagnosis. It is an uncommon thing for a chronic ulcer to declare its presence by profuse hæmorrhage as the first symptom, but cases now and then occur in which a latent chronic ulcer is recognized by the presence of occult blood in the fæces, examined by reason of the unaccountable anæmia of the patient. Such cases, in the absence of a radiographic demonstration, may for a time be indistinguishable from cancer of the stomach or intestine.

(2) *Disorders of Function.*

The ulcer acts as an irritant and interferes with both motor and secretory functions of the stomach. It is essentially the chronic ulcer which increases the muscular irritability of the stomach, giving rise to pyloric hypertension or spasm, with diminished rate of emptying, or spasm in other parts of the stomach. Acute ulcer does not set up those muscular disturbances unless it happens to be situated close to one or other orifice, and hence the common absence of characteristic symptoms in this type of the disease. These muscular disorders are recognized by the symptoms they produce, also by the X-rays. The only symptom of importance in the diagnosis of chronic gastric ulcer to which these alterations in muscular tension give rise is pain. The pain of a gastric ulcer has certainly very definite characteristics, but the difficulty is that precisely the same kind of pain is met with as the result of similar functional disturbances occurring as primary gastric conditions, or as the effects of disease in other portions of the alimentary system. It is quite true that the pain in these latter conditions varies considerably in its characters, but it is equally true that the pain of ulcer does not always conform to the characteristic type, and that it is also varied by peritoneal inflammation, by adhesions to and involvement of other organs, and by obstructions in the stomach. Pain must, however, rank high as a diagnostic symptom, because

the majority of patients suffering from chronic gastric ulcer first seek advice on account of this symptom, and by certain characteristics of the pain we make a provisional diagnosis, and find that in a considerable proportion of cases it turns out to be correct.

The most important characters of pain suggestive of ulcer are :—

(1) Its situation in the epigastric zone. Pain in other positions is without significance.

(2) The frequent features of a referred pain with accompanying tenderness and muscular rigidity.

(3) The tendency to severity, sufficiently so to awake the patient at night, the pain recurring over and over again in more or less prolonged attacks. These attacks have much more significance in men than in women, on account of the liability of the latter sex to nervous irritability of the stomach.

(4) Occurrence during the digestive process, and cessation when the stomach is emptied naturally or by vomiting. There is an interval of freedom after eating, varying from about a quarter of an hour up to two or three hours, the relief afforded by food being more noticeable to the patient when the pain comes on late, and in these cases the ulcer is usually situated near the pylorus. Its intensity varies in proportion to the degree of work which is presented to the stomach, and it is easily relieved by rest and dieting.

The characteristic pain of a duodenal ulcer is more likely to occur at a later period after food, and to be relieved at once and completely by eating.

(5) That the characters tend to be constant in the same patient.

The same remarks apply to the secretory as well as to the motor function of the stomach. It is, therefore, not to be supposed that the examination of the gastric contents would reveal any special condition of secretion or digestion peculiar to ulcer, and such is found to be the case. There is, however, no doubt that here again ulcer tends to produce certain fairly regularly recurring alterations, which, taken in conjunction with other findings, are of value in diagnosis. The difficulty is to understand what is the exact meaning of the results obtained by the present methods of gastric analysis.

The single test meal estimated by Vollhardt's method give the total percentage amount of free and combined HCl present at any particular period of gastric digestion selected, this point of time being that at which the HCl is supposed to be at a maximum. Hypersecretion is presumed to exist if 80-100 c.c. or more of fluid containing HCl are found in the fasting stomach, which has been washed out the previous night. The gastric contents, however, constitute a mixture of substances the composition of which is constantly changing, and herein lies the weakness of the single test meal.

The fractional method introduced by Rehfus meets this difficulty and curves may be plotted out during gastric digestion, showing the changes in the percentages of free HCl and of the total acidity. Rehfus and his followers regard these as secretory curves. If the curve forms a single peak, gradually rising to a maximum and falling again, it is called isosecretory or hyposecretory according to its height. If it rises to a higher level still, which is maintained without much, if any, fall, it is called hypersecretory, and in this type there is usually considerable secretion into the fasting stomach. The hypersecretory is the type of curve commonly found in pyloric ulcer amongst other conditions, whilst the isosecretory or hyposecretory is more characteristic of ulcer of the body of the stomach. It is impossible to say what is the meaning of these curves without more precise information, but it is quite clear that they are not curves showing the course of gastric secretion, an opinion already expressed by other observers.

With the object of ascertaining what is the actual course of events during digestion, Goodhart and myself have examined a considerable number of individuals, making complete chloride estimations by the Vollhardt method every quarter of an hour, and a communication on our results is now in the press. We find that the total HCl curve closely follows that of the total acidity, rising to a peak with a sharp or flattened apex and falling again as digestion proceeds. The fall in the curve corresponds to a sharp rise in the curve of inorganic chlorides, which shows that this fall is due to a rapid neutralization of the HCl by an alkaline fluid. The curve of total chlorides continues to rise and maintains a high level as the stomach empties. This curve of total chlorides most nearly represents the course of the secretory curve, which runs at a somewhat lower level. The neutralization of the HCl causing the fall in that curve is due to duodenal regurgitation of intestinal contents, which results from lessened pyloric tone at a certain stage of gastric digestion. In those cases in which the HCl curve does not fall, the inorganic chloride curve remains low, showing that there is deficient relaxation of the pylorus or what may be called hypertonus or spasm of that structure. These observations are in agreement with the hypothesis of Boldyreff.

With regard to gastric ulcer, we have found that, although some curves are of average normal type, the characteristic feature shown by most of them consists in varying degrees of pyloric hypertonus reaching its height in organic pyloric obstruction.

We may conclude that an excess of total HCl found after the single test meal, and the so-called "climbing type" of acidity curve found by the fractional method, are both indicative of heightened pyloric tone, but are not necessarily indicative of hypersecretion, and are in keeping with the diagnosis of pyloric ulcer. In ulcer of the body the examinations are likely to give average normal results. The finding in the fasting stomach of 80 to 100 c.c. or more of mixed gastric and intestinal juices without food residue is also indicative of ulcer.

Dr. A. E. BARCLAY.

Dr. J. H. RYFFELL.

[These contributions to the Discussion are printed in the *Lancet*, February 4, 1922, pp. 219, 236.]

Sir CUTHBERT WALLACE, K.C.M.G., C.B.

The treatment of gastric ulcer has suffered, I think, from dual control. The physician sees the beginning and the surgeon sees the end. Except in a few fortunate cases, the surgeon is unable to compare the symptoms produced by inorganic lesions and acute ulcer with those that he meets with in well-established ulcer. The physician, on the other hand, while he has the opportunity of comparing the symptoms of the different lesions, has not the same opportunity as the surgeon of inspecting and handling the actual lesions. The duty of the surgeon in this discussion will be to tell what, next to the opinion of the physician, he has found most useful in arriving at a diagnosis.

The clinical history is all-important: other methods of examination only tend to confirm or refute the diagnosis previously arrived at. The periodicity of the attacks and the length of time over which these attacks have taken place is extremely significant. In the future it is to be hoped that the length of time

that the patient has suffered will be considerably reduced and so one of the means of diagnosis will be curtailed.

In considering the chronic ulcer one wonders what happens to the ulcer in the quiet intervals. Does it become healed, or does it simply become painless? Again, what causes the pain? Is it the friction of the stomach contents or the irritation of the gastric juice, or the disturbance of the ulcerated surface set up by the muscular movements, or is it the pain due to irregular muscular action?

Most people suffering from chronic gastric ulcer refer the pain to the epigastrium and exhibit a tender spot somewhere in the same region, provided the examination is made during an attack. The situation of the pain and tenderness is of no value in locating the situation of the ulcer.

The ingestion of food may be said to alter the patient's sensation; it usually either causes pain, or allays pain, or allays it only to aggravate it later. The important thing is that, if food causes pain, there is a distinct interval between the taking of food and the appearance of the pain. This interval tends to be longer the closer the ulcer is to the pylorus. The pain tends to become constant if the ulcer becomes adherent, or if it is of a carcinomatous nature, though, even in carcinoma, pain may be entirely absent. Nocturnal pain is specially associated with a duodenal lesion and, judging from my experience, it seems to render the prognosis specially good after surgical measures have been taken.

Vomiting is a fairly constant symptom and is preceded by pain. It comes on after an interval and, in the case of gastric ulcer, often relieves the pain. The copious vomiting of obstruction is well known.

I have not sufficient experience to express an opinion as to the value of fractional meals, but minor variations in the content of the ordinary test meal are not particularly helpful, except that a high HCl percentage usually indicates an ulcer near the pylorus. HCl may be absent in the chronic dyspepsias and in acute carcinoma, in which case there is often lactic acid.

I have found X-ray examinations most helpful in showing the following appearances:—

(1) The abiding patch of bismuth at the seat of the ulcer, most readily seen when the ulcer is on the profile of the stomach.

(2) The constriction deformity. When due to cicatricial contraction, the constriction tends to be long and narrow, or the deformity in the stomach forms an open V, with base towards the greater curvature. When due to muscular action, it is very limited, so that the peritoneum covering the opposed sides of the constriction is almost in contact.

(3) The filling defect often associated with carcinoma.

(4) The abnormality of the duodenal cap, either in the direction of persistence or slow filling, or of deformity, which points fairly definitely to a duodenal or pyloric lesion, though the abnormality may be caused by extramural adhesions.

It is difficult to distinguish between a persistent spasm and the spasm due to an ulcer: but if there is no constriction ring, or no abnormality of form present, it is unlikely that the condition can be remedied by the surgeon.

The diagnosis of carcinoma from simple ulcer is extremely difficult, even if it is possible without an operation and microscopic examination. Pain may be absent or constant, HCl may be absent and lactic acid may be present. There is usually a deformity of the stomach or a filling defect. Put in this way, the diagnosis seems rather hopeless. Put in another way, it is much more definite: In a middle-aged individual, a comparatively short history of gastric trouble, an absence of HCl, and the presence of lactic acid, a filling defect or

abnormal shape after a bismuth meal, are fair indications that carcinoma is present.

I have been much struck with the insignificance of the abnormalities found in the duodenum, when a duodenal syndrome has been present and X-rays have shown some abnormality. So insignificant are these ulcers or excoriations that one can almost believe that they were produced by the surgeon when he opened the duodenum for the purposes of exploration, and that a duodenal syndrome may be present without a breach of continuity of the mucous membrane.

In conclusion, the greater dependence must still be placed on the clinical history and symptoms; and, if the symptoms do not yield after reasonable treatment, or if they recur, exploration is the proper course.

Dr. BERNARD SPILSBURY.

[This contribution to the Discussion is printed in abstract in the *British Medical Journal*, February 4, 1922, pp. 189, 190, and will shortly be published in full in the *Quarterly Journal of Medicine*.]

Dr. W. GORDON.

I will deal briefly with a number of points.

(1) *Gastrostaxis* is held to account for some cases of fatal hæmorrhage. I cannot help being sceptical about this. It seems to me that the œsophageal veins, in these cases, have escaped the scrutiny they deserve.

(2) In *gastric perforation* I would lay stress on what may be called *extended gastric resonance*, as more useful in diagnosis than diminished hepatic dullness; a hyper-resonant note often reaches half-way up the sternum when the liver dullness persists to the right of it.

(3) *Acute pancreatitis* would be more often diagnosed than it is, if its name were kept associated in the mind with that of gastric perforation, as it ought to be, seeing that acute pancreatitis more closely mimics gastric perforation than does any other condition.

(4) The *onset of diabetic coma* may simulate gastric perforation, yet it is not mentioned in many excellent text-books as doing so. It may be accompanied by severe epigastric pain, coming on rapidly and causing considerable collapse. If diabetes has not been known to exist and if the urine is not examined, mistake may follow. I have seen a boy admitted to hospital as an "acute abdomen," whose urine was found loaded with sugar and who died of diabetic coma.

(5) In *subdiaphragmatic abscess*, *leucocytosis* may help diagnosis. It would be more commonly looked for if it were not generally supposed that the lengthy proceeding of a regular blood count is necessary. For many years I have used a simple microscopical observation of an ordinary fresh blood film. Considerable leucocytosis is at once obvious. (Incidentally, it may be said that leucopenia and eosinophilia are as easily identified.)

(6) A *latent abscess* may sometimes cause surprisingly little disturbance. A man came under my care a few years ago with a history of sudden severe abdominal pain a year previously. There was recovery—so-called—without operation, and there were no symptoms until recently, when he was again seized with acute pain, this time in the left side, followed by expectoration of fœtid material. The diagnosis of intrathoracic rupture of a subdiaphragmatic abscess was reasonably plain and an autopsy confirmed it.

(7) *Syphilis* as a cause of gastric ulcer is uncommon in this country, but should not be forgotten. I remember a case which came under my care, a year after gastro-enterostomy for gastric ulcer, none the better but rather the worse, with severe nocturnal pain and some swelling in the pyloric region. The patient did not improve until I added iodide to his mixture, after discovering that he had had syphilis twenty years before. Improvement was then immediate and remarkable. The after-history excluded cancer.

(8) The frequency of ulcer as a forerunner of cancer in the stomach has lately been greatly overstated. My experience entirely confirms the older view that such cases are relatively rare. The error (such I consider it) has arisen because certain distinguished surgeons are so well known for their treatment of gastric ulcer as to attract a highly specialized class of clinical material, utterly unsuited for general deductions. I notice the radiologists are expressing their adherence to the older view. In diagnosis I should be inclined to think that a probable preceding history of gastric ulcer pointed rather to the recurrence of ulcer than to the supervention of cancer.

[Dr. GORDON further stated his belief that a diminution of the recumbent cardiac dullness was an indication of gastric carcinoma. Finally he urged that laparotomy should only be carried out in the last instance, owing to the danger from adhesions.]

Dr. J. A. RYLE.

I will deal briefly with two aspects of the diagnosis of gastric and duodenal ulcer, the one concerned with a chemical and the second with a clinical method. Sufficient stress has not been laid upon the importance of the hypersecretory curve as obtained by the fractional method of gastric analysis. I agree with previous speakers that there is no diagnostic curve in ulcers of the lesser curvature and that hyposecretory or normal types of curve are commonly obtained in cases of ulcer of the body of the stomach. In duodenal or juxta-pyloric ulcer, however, I maintain that the hypersecretory curve, showing a resting acidity of a high figure and after the initial fall a steep climb to a high point with a subsequent sustained plateau, can be regarded as of real diagnostic value. The resting juice should always be examined. Although hypersecretory curves are met with in other conditions, such as appendicitis or gall-stones, in which reflex pyloric hypertonus is produced, it may be stated that in a case presenting an ulcer history a hypersecretory curve is valuable in locating the ulcer in the neighbourhood of the pylorus.

From the clinical point of view I have been investigating the various reflex signs, and although all will admit that the history and a careful analysis of the symptoms come first in the examination I consider that the so-called viscerosensory and visceromotor reflexes are of by no means negligible value. The signs to which I pay attention are: (1) Superficial cutaneous hyperalgesia; (2) deep cutaneous hyperalgesia; (3) unilateral exaggeration of the abdominal reflex; (4) increased muscular tonus or rigidity; and (5) deep tenderness. These signs are more likely to be found present during or shortly after the presence of spontaneous pain but sometimes persist for much longer periods. In a very small series observed up-to-date I have found deep tenderness present in from 60 to 70 per cent.; muscular rigidity, usually on the right in duodenal ulcer and on the left in lesser curvature ulcer, in 40 per cent.; deep cutaneous hyperalgesia in from 30 to 40 per cent.; an exaggerated abdominal reflex on one side in about 15 per cent. and superficial cutaneous hyperalgesia in 8 per

cent. of the cases examined. So far I have not found these signs present in cases which are shown to have no organic lesion or in cases of definitely healed ulcer. Their disappearance can be watched during the course of treatment of ulcer cases.

MR. J. MAGNUS REDDING.

In considering the X-ray diagnosis of gastric ulcer it must be recognized that there are two distinct methods in use at the present time:—

(1) The indirect or continental method, in which screen examination is used to obtain information as to abnormalities of function such as variations in tone, peristalsis, &c.; this information being correlated with clinical and analytical data to form "symptom-complexes." An extremely rigid routine as regards the nature and quantity of the meal, times of examination, &c., forms an essential part of the technique.

(2) The direct method, of comparatively recent origin, by which the actual deformity of gastric contour produced by an ulcer is shown on serial plates. I rely on this latter method entirely.

The essential points in the technique of the direct method are: (a) The employment of a fluid meal, which will readily fill small irregularities, but which will also hold the barium in good suspension; (b) ultimate reliance on radiograms instead of on the screen image. Briefly, the direct diagnosis of gastric ulcer depends on the presence of a constant deformity of the gastric outline, the deformity being differentiated from that of other organic lesions of the stomach. The deformity may be: (a) A projection from the outline, i.e., a niche or an accessory pocket; (b) a defect in the outline, i.e., a filling defect; (c) organic hour-glass deformity; (d) pyloric stenosis.

The essential quality for diagnosis of an organic lesion is the constancy of the abnormality. This does not necessarily mean that a precisely similar appearance is seen in all radiograms; but what must be insisted upon is that the area under suspicion constantly shows a deformity of the same nature, e.g., a projection from, or a defect in, the normal contour.

Spasmodic deformities of the stomach present great difficulties to the radiologist. The common forms of spasm are the incisura, or spasmodic hour-glass contraction, and widespread spasticity of the pyloric antrum. Either may occur as the result of a gastric lesion, or may be present in a stomach organically normal. Spasticity of the pyloric antrum is much more commonly associated with lesions of the biliary tract or of the appendix than with a gastric ulcer. *Belladonna, given to physiological effect*, nearly always produces relaxation of a spasm which is not due to an organic gastric lesion. In rare instances, however, a gastric incisura associated with a duodenal ulcer persists in spite of the administration of this drug.

DR. T. IZOD BENNETT.

The gastric secretion is in no way altered by gastric ulcer, and the type of curve obtained by the analysis of fractional test meals depends entirely on the state of the pylorus. True gastric hypersecretion is in no way connected with gastric ulcer, although it may occur in certain gastric affections sometimes accompanying ulcer. As a test of true gastric hypersecretion the tension of alveolar CO₂, which varies with the acidity of the gastric secretion, provides a more certain index.

Section of Medicine.

President—Dr. G. NEWTON PITT, O.B.E.

DISCUSSION ON THE TREATMENT OF GASTRIC ULCER.

Sir WILLIAM HALE-WHITE, K.B.E.

[This contribution to the Discussion is printed in the *Lancet*, February 11, 1922, p. 277.]

Sir BERKELEY MOYNIHAN, K.C.M.G.

Gastric ulcers are usually classified as acute and chronic. An acute gastric ulcer hardly deserves its name. It is a crack, chap, fissure or erosion on the surface of the mucosa, extending, if it extends at all, rapidly and narrowly through the coats of the stomach to the peritoneal surface. On its way it may open a vessel and so cause hæmorrhage; if it reach the serous coat no time for an adequate defence has been allowed, and a perforation results. Hæmorrhage and perforation are the only clinical evidences of an acute ulcer. When, at the time of operation or upon the post-mortem table, an acute ulcer is found it must not be held to account for the presence of symptoms of which the patient has complained for months or years, in intermittent attacks.

The relations between an acute ulcer and a chronic ulcer are a matter of surmise rather than certainty. Authors whose work demands our approbation assert that a chronic ulcer develops from an acute ulcer. By the time that the chronic ulcer is recognized by the pathologist or by the surgeon it is almost always of such size and depth that its earliest stage is long past, and no confident opinion can then be held with regard to it.

The chronic ulcer seen upon the operation table is a well-established lesion, in which the whole thickness of the mucosa has perished, and in which a defence—an attempt at healing—has been set up to a degree which may cause the ulcer to be callous, with an indurated edge and a firm base. It is by no means rare for the penetration of the coats of the stomach to occur to such a depth as to cause adhesion to the liver, pancreas, or abdominal wall.

Treatment of a gastric ulcer, whether medical or surgical, must be based upon an accurate diagnosis. Probably no diagnosis of any abdominal disease is so apt to be erroneous as that of gastric ulcer. If these diagnoses, based upon a tradition that is moribund, are accepted, the gross numbers of gastric ulcer are found to be enormous, and a great preponderance of cases among females will be found. Gastric ulcer is a rare disease, less than half as frequent as duodenal ulcer, and it occurs approximately twice as often in men as in women. Its diagnosis upon clinical evidence alone is full of difficulties and beset with error, and chemistry offers the slenderest help. And this inaccuracy of medical diagnosis has resulted in surgical disasters unhappily very numerous. Upon grounds that seem sound, and with evidence apparently unassailable, a diagnosis of gastric ulcer may be made; the symptoms have been so serious and so often recurrent that an operation is advised. The diagnosis of gastric

[February 2, 1922.]

ulcer is accepted, and gastro-enterostomy is performed when no lesion exists in the stomach or duodenum to justify it. The patient is made worse rather than better. And so physicians who see the surgical failures will tell us that gastro-enterostomy is an operation giving uniformly bad results, and that the surgical treatment of ulcers of the stomach or duodenum is often disastrous. We who see many cases of these disorders know that it falls to our lot sometimes to undo the work of others, to unmake an anastomosis between the stomach and the duodenum that was never needed. In such cases I have on a few occasions known a jejunal ulcer develop, a condition vastly more serious and more painful than the original lesion, if any, that was wrongly diagnosed. And error of diagnosis affects also the estimated results of medical treatment. If a gastric ulcer is diagnosed when none is there of what value is our assessment of the efficacy of the medical treatment directed to the phantom lesion? Errors in diagnosis vitiate our opinion of the value both of medical and of surgical treatment. So important is the need for a correct diagnosis before any treatment is commenced, or before judgment is passed upon the merits of treatment advocated by even the greatest of experts, that all opinions, however authoritative they appear to be, based only upon clinical evidence, should be ignored. There are at present two methods, and two methods only, of making an unequivocal diagnosis of gastric ulcer—recognition by the radiologist, inspection by the surgeon. We need evidence based upon a successive series of events before we can truly appraise the value of therapeutic measures. Such events are:—

- (a) The diagnosis of the ulcer by one of these methods.
- (b) Treatment carried out by the Sippy or other method, based upon lavage, dietetic control, administration of drugs.
- (c) Inspection of the stomach by the radiologist showing that the ulcer is healed.
- (d) A clinical survey, and a further radiological examination in, say one, two or three years, to show that the ulcer remains healed.

The present medical treatment of a chronic gastric ulcer is woefully inefficient. For the rich it is possible, for the poor it is hardly to be attained, since the hospital accommodation in the country is grossly inadequate for the treatment of this and of many other diseases.

Medical treatment if properly carried out for a sufficiently prolonged period should enable an ulcer to heal. The need for surgical treatment is a confession that such treatment is unattainable or has failed.

If, to the surgeon's reluctance (for every surgeon is a physician at heart) an operation is necessary, what form shall it take? The growth of surgical methods in the treatment of chronic ulcer has been gradual. In the earliest years of gastric surgery the cases that came for treatment usually showed an obstructive lesion at or near the pylorus. Gastro-enterostomy then acted like a charm. The pinched, wasted, unhappy sufferer, dreading every meal, was able to take food with a relish that he had almost forgotten. He gained weight, knew the joys and the vigour of life once again, and became a decoy for other dyspeptics. They, unhappily, if diagnosed as examples of gastric ulcer when no ulcer was present, were similarly treated with results which were discreditable both to the clinician and to the operator.

Surgical treatment, if it is to be uniformly successful, and based upon a long survey of the patient's subsequent history, must deal once for all, if that is possible, with the lesion responsible for the symptoms. Temporary relief follows medical treatment; if nothing better follows surgical treatment, there is

no advantage in operation. Surgery must justify itself not only in the immediate safety of its procedures, but in the bestowal of sustained good health in respect of the organs with which it deals. It is not only the number of the recoveries that count, but also the quality and the permanence of each. The preparation of a patient for operation is of great importance. In addition to the routine examination of organs and secretions two special points require emphasis: (1) the need for the examination of the teeth and accessory sinuses; and (2) the need for the administration of glucose in large quantities or for the direct transfusion of blood. The source of the infection which has helped to cause the ulcer may be discovered by the former; the effects of the weakness, wasting and desiccation of the patient are counteracted by the other. The procedures that have been adopted are the following: (1) Gastro-enterostomy; (2) excision of the ulcer; (3) gastro-enterostomy combined with excision; (4) gastro-enterostomy combined with destruction of the ulcer by cautery (Balfour's operation); (5) median resection of the stomach, "sleeve resection"; (6) gastro-enterostomy combined with jejunostomy (Moynihan's operation); (7) partial gastrectomy. Where there is so much choice it is evident that in the popular judgment no operation has surpassed the others in safety and success.

(1) The operation of *gastro-enterostomy* has been the most frequently performed of all operations. In the earliest days most of the cases coming to the surgeon for relief were those in which pyloric obstruction was present. The results of the short-circuiting operation were very striking and immediate, and the mortality was low. Largely owing to the advocacy of Doyen the range of the operation was extended, and cases of gastric ulcer in which the lesion was in the body of the stomach, or even at the cardiac end, were treated by this operation. The results were by no means so good; there were still satisfactory recoveries but there were many cases that gave dissatisfaction. A revision of my own early cases showed that the results were sometimes good, often indifferent and sometimes bad, secondary operations being required or carcinoma making a tardy appearance.

This evidence as to the value of *gastro-enterostomy* in my own cases and the conflicting views of many surgeons of equal experience, led to a consideration of the means by which the operation produced its results. Two views were held:—

(i) That the operation was purely mechanical in its effects. The making of an opening between the stomach and the portion of the intestines created an alternative and easier route for the passage of food. Retention, therefore, did not occur; indeed, the emptying of the stomach proceeded more rapidly than was normal. Now retention in the stomach is due to many causes connected with a chronic ulcer. Some of these are: (a) Cicatricial stenosis; (b) spasm at the level of the ulcer, as shown by the "incisura" of the radiographers; (c) a spasm of the pylorus, not constant but occasional, occurring even when the ulcer is in the body of the stomach or at any part of the lesser curvature. *Gastro-enterostomy* attained its greatest efficiency when a scar at or near the pylorus was causing a high degree of obstruction. The fact that an obstructive spasm is present even when the ulcer itself does not obstruct, accounts, I think, for the relief which *gastro-enterostomy* gives in such conditions. Radiography shows that a pyloric spasm causing a "six-hour retention" of food is present in about one-third of the cases of ulcer on the lesser curvature of the stomach. This is roughly the proportion of cases improved by *gastro-enterostomy*. Such value as *gastro-enterostomy* possesses in cases of gastric ulcer I believe to be

due entirely to the short circuit, which avoids a pyloric muscular obstruction and prevents the undue retention of food in the stomach.

(ii) That the operation possessed a "physiological" value. On this hypothesis the entrance of the alkaline bile and pancreatic juice through the anastomotic opening produces in the stomach a medium, the reaction of which is favourable to the healing of an ulcer. Now a cell of the gastric mucous membrane is born in an acid medium, lives its life and performs its due functions in an acid medium, and perishes in an acid medium. If the conversion of this medium from an acid to an alkaline one is to be described in a word, it should surely be "anti-physiological." Is there any reasonable proof that an alkaline medium favours the healing of an ulcer? Of surmise there is no end, but of certainty nothing. I have given reasons elsewhere for the difficulty I find in believing that the view of the "physiological" action of the operation of gastro-enterostomy can be supported by any argument or any experience that will bear discussion.

It is interesting further to note that when gastro-enterostomy has been performed for duodenal ulcer a gastric ulcer may develop. Sherren and I have both observed this, and cases are reported from the Mayo Clinic and by Coffey. I have known perforation of a second and a third gastric ulcer occur after gastro-enterostomy had been performed for the first ulcer, which remained unhealed. Sherren records the development of gastric carcinoma upon an ulcer developed after gastro-enterostomy and I have seen one example of this also. For all these reasons I think that gastro-enterostomy, if practised at all, should be reserved for those cases in which the ulcer is distal to the opening to be made, in which no reasonable doubt can be entertained as to the benignity of the ulcer, and in which the patient's condition renders a more extensive operation too hazardous. As a customary procedure it should be abandoned, for its immediate mortality differs little from that of gastrectomy; after its performance malignant changes in the ulcer may develop or progress and cause death; the ulcer may fail to heal, or new ulcers in the stomach may develop and gastro-jejunal or jejunal ulcer may subsequently occur.

(2) The operation of *excision* gave great promise. We are all well aware of the frequency with which the perforation of an ulcer, when treated by suture alone, has resulted in the complete abeyance of all gastric symptoms. The hope was strongly felt that the excision of an ulcer would lead to a speedy and permanent recovery. But experience made haste to show that our hopes were unsubstantial. After excision a degree of contraction of the stomach occurred which caused a distortion of the organ, and obstruction developed; or the ulcer recurred along the suture line. In thirty-nine cases, fifteen showed a severe recurrence of trouble and a further operation was needed in eleven. I have quite abandoned the method.

(3) *Gastro-enterostomy* combined with *excision* gave good results in many cases but not in a number that was adequate. The method is by no means so satisfactory as:—

(4) *Balfour's operation*, which consists in the destruction of the ulcer by the actual cautery, and the subsequent performance of gastro-enterostomy. Recently a very substantial plea for the more frequent performance of this method has been published by Balfour. The operation is simple, safe and satisfactory in respect of after-results so far as the records at present available appear to show. The application of heat to the edges of the excised ulcer is far more effective than the knife in the destruction of cells which are cancerous or in danger of becoming so. Only one operation can be compared with it,

gastrectomy; and for reasons I will give later my choice falls upon the latter.

(5) *Median resection of the stomach* has its most able advocates. In April of last year I had the good fortune to see this operation exquisitely performed in Rome in two cases, by Alessandro. The clinical results are said to be good, but I have seen a recurrence of symptoms and fresh ulceration along the suture line. The radiological examination of patients submitted to this operation, as Duval has shown, gives reasons for the belief that contraction of the suture lines and stasis in consequence, are by no means uncommon.

(6) In some few cases, sixteen in all my experience, the ulcer is so large, is so firmly adherent, or so deeply excavates a viscus, in a patient whose condition is so extremely poor that only a very speedy and simple operation can be tolerated. In such cases I perform *gastro-enterostomy* in "Y," making the opening into the stomach of very large size. The proximal part of the jejunum, forming the Y, is opened up by a small incision through which a tube is passed downwards into the intestine. Through this tube the patient is fed for such a period as will allow the ulcer to heal. When an X-ray examination shows that the ulcer is healed, no crater and no notch being visible, the tube is removed and the jejunostomy opening is closed. In one case of mine no food was taken by the mouth for three years nine months.

(7) *Gastrectomy*.—This is for me the most satisfactory operation. All other operations fail in one or more particulars, in that the quality of the recovery is poor, the recurrence of symptoms not infrequent, or the mortality high. Gastrectomy has a small mortality, and its results are as near perfection as they can be. All other operations leave the surgeon handicapped by the fear of recurrence of the ulcer. After gastrectomy I have never seen a recurrence of ulceration. Indeed, the after-history is remarkable for its placid excellence. One of the dangers in every case of gastric ulcer is the transition of malignancy. No one doubts that this occurs, though various opinions are expressed as to the frequency of the occurrence. So far as published records tell us, the risk of death from carcinoma of the stomach after the successful performance of gastro-enterostomy for a gastric ulcer (and this has its own mortality) is greater than the risks of gastrectomy. To distinguish a chronic gastric ulcer from carcinoma of the stomach is sometimes impossible for the most expert of surgeons. If such a difficulty is met with in a case treated by gastro-enterostomy the patient inevitably dies of his disease. If gastrectomy is performed there is a good prospect of cure. The operation itself is now much simplified. When the stomach is freed from the duodenum and along the two curvatures, the question to decide is as to the method of attachment of the jejunum to the part of the stomach which remains. At the present time I join the cut end of the stomach to the jejunum drawn straight across the colon near the splenic flexure from left to right. The proximal part of the jejunum meets the greater curvature of the stomach, and no jejunal loop is left. This reduces the operation to its simplest terms; and to the easiest and speediest performance.

I have now to add certain figures to the statistics I gave before the British Medical Association in July, 1920.¹

The number of gastrectomies for gastric ulcer I have performed since 1909 is 118. There have been two deaths, a mortality of less than 2 per cent. In one case a secondary operation was necessary on account of the long loop left

¹ *Brit. Med. Journ.*, 1920, ii, p. 103.

in the jejunum, when the older method of the anastomosis was used. There have been no other secondary operations. Only one case has had any symptoms of digestive discomfort since. The patient was a young lady from whom I removed the stomach for a chronic ulcer of the lesser curvature, and from whom also I removed a group of tuberculous mesenteric glands. Since the operation intermittent attacks of diarrhoea have occurred with temporary wasting. This is the only unsatisfactory case in the series; in none has there been the development of carcinoma or a return of ulceration. In the same period I have operated upon 651 cases of duodenal ulcer with three deaths.

Mr. JAMES SHERREN, C.B.E.

[This contribution to the Discussion is printed in the *Lancet*, February 11, 1922, p. 278.]

Sir W. H. WILLCOX, K.C.I.E., C.B., C.M.G., M.D.

It is difficult to formulate rules for the treatment of gastric ulcer since each case presents individual features in regard to its history and clinical symptoms. It is in accordance with these that the line of treatment is laid down, so that no two cases will be treated in an exactly similar way. Except in those very acute cases such as perforation or almost complete pyloric obstruction, where immediate surgical measures are imperative if life is to be saved, it may, I think, be accepted that a careful course of treatment should be carried out on medical lines. This may in some cases result in the healing of the ulcer and the cure of the patient, but even if the treatment does not achieve this object, if carefully conducted it will undoubtedly place the patient in a more suitable condition for undergoing surgical treatment afterwards.

Early Cases.—In a case in which the diagnosis has been established by the methods so fully discussed at the previous meeting of the Section, if the history shows a duration of symptoms of a few weeks only there is a reasonable prospect of cure by medical treatment. Dr. Spilsbury's contribution was encouraging in this respect, for he laid stress on the frequency of well marked evidence of the healing process in cases of gastric ulcer seen in the post-mortem room.¹

The following line of procedure has been found by me to be most satisfactory:—

(1) *Complete Rest in Bed.*—Regular feeds every two hours of 6 oz. of citrated milk, to which is added 20 gr. of bicarbonate of soda. The citration of the milk is effected by adding 1 gr. of citrate of soda to each ounce of milk—over-citration is to be avoided since it may predispose to hæmorrhage.

(2) The first important part of the treatment is the *removal as far as possible of sources of infection from the mouth*. A careful examination of the teeth should be made and those obviously septic should be extracted. All carious teeth and those showing evidence of pyorrhœa should be removed. In my experience oral sepsis is the most important cause of gastric ulcer and in cases in which the gums and teeth are to external appearances healthy, a careful X-ray examination frequently reveals the presence of apical dental infection in the shape of apical dental granulomata or even abscesses. In all cases an X-ray examination of the teeth should be made, and teeth showing

¹ See *Brit. Med. Journ.*, February 4, 1922, p. 190.

evidence of being sources of infection should be removed. It is well that such teeth should be submitted to a bacteriological examination, care being taken to prevent external contamination as far as possible. In these teeth evidence is almost always obtained of the presence of streptococci other than those which are the inhabitants of the healthy mouth. Since oral sepsis as a causative factor in gastric ulcer is generally accompanied by a like infection of the intestinal tract it is advisable that daily Plombières colon irrigation should be carried out for a few days, and a bacteriological examination made of the intestinal washings. In many cases an abnormal preponderance of pathogenic streptococci will be found. A combined vaccine of the streptococci from the mouth and intestines may be made with advantage and reserved for use if required. When the mouth has been set in order and the colon irrigations have been carried out for a few days, the following method of treatment is advisable:—

(3) *Diet* on the lines laid down by Lenhartz has been found most satisfactory, and coupled with this a mixture containing bismuth carbonate 20 gr., magnesium carbonate 10 gr. with 40 gr. of bicarbonate of soda given an hour after food. To the mixture glycerine of carbolic acid 5 to 10 minims may be added with advantage for its antiseptic properties, and in cases of hypersecretion tincture of belladonna in 5-minim doses should be added. Large doses of alkalies must be given in order to be effective and they should be repeated at four-hourly intervals.

In this connexion may be mentioned a case of pyloric ulcer in a medical man whom I saw twelve years ago. He had had three severe attacks of hæmatemesis and melæna, at intervals of a few months, from a pyloric ulcer, and in consequence of this I advised operation; but in the interim he was to take a mixture of bismuth carbonate and sodium bicarbonate in large doses three times a day. The patient was very averse to operation and said to himself, "if the medicine is really effective surely it should be taken at night as well as by day," so he took the medicine every four hours, day and night, for three weeks. He made a complete recovery without operation and has been well ever since.

In my experience medicinal treatment on the lines laid down above usually results in apparent cure in early cases.

Recurrent Cases.

It is very common to meet with cases in which several attacks of gastric symptoms have occurred, each lasting several weeks or months. In such cases a course of treatment on the lines laid down should be carried out, but if when the patient has reached the full dietary on the Lenhartz method symptoms should still recur surgical treatment is advisable.

Hæmorrhage.

In cases of gastric ulcer in which the diagnosis has been established (I am not referring to cases of gastrostaxis or hæmatemesis from causes other than gastric ulcer), the usual remedies for the arrest of hæmorrhage should be given, including serum injections. It is advisable in my experience to withhold all food by the mouth except occasional teaspoonful sips of hot water or a little ice. Normal saline should be given *per rectum* every four to six hours, as much as can be retained, to which may be added 2 per cent. of glucose. Five days after the hæmorrhage has ceased the Lenhartz diet should be given.

It is extremely rare in my experience for a patient to die from hæmorrhage from gastric ulcer, and I do not favour surgical treatment in the acute stage of

this condition. When in spite of treatment the hæmorrhage recurs operation may be necessary. In one case recently under my care the patient had four recurrent attacks of hæmatemesis at intervals of about six days respectively. Since a fatal result seemed probable without surgical treatment my colleague, Mr. Maynard Smith, operated upon the patient, who was given a blood transfusion immediately before the operation. This procedure was most satisfactory and the patient made a good recovery, putting on 2 st. in weight after the operation.

Gastric lavage with solution of bicarbonate of soda 1 dr. to the pint has been found useful in cases of pyloric ulcer associated with spasm of the pylorus, and this followed by medicinal treatment may be successful.

Occurrence of Growth in Gastric Ulcer.

In my experience this is so rare, that the possibility of its occurrence should not deter one from carrying out careful treatment on medicinal lines in cases of gastric ulcer. The very interesting observation of Dr. Spilsbury in the previous discussion¹ supports this line of action.

Surgical Treatment.

(a) *Hour-glass Contractions of the Stomach.*—In these cases symptoms persist usually in spite of medical treatment, and surgical treatment becomes necessary. In one case under my care recently in which the patient was operated upon by Mr. Clayton-Greene the anatomical conditions resulting from the large ulcer rendered gastro-enterostomy impossible. In this case a junction was made between the two halves of the stomach and the gastro-gastrostomy carried out yielded a very successful result.

(b) *In cases of pyloric obstruction* which does not disappear under medical treatment, surgical treatment is necessary and gives brilliant results.

(c) *In cases with recurrent attacks with hæmorrhage* surgical treatment is also indicated.

(d) *In cases of chronic ulcer* in which medical treatment fails to give permanent relief surgical treatment is equally advisable.

(e) It need hardly be said that immediate surgical treatment is imperative where *signs of perforation* are present.

It may be added that after surgical treatment in some cases a recurrence of symptoms may occur after perhaps a long period. In such cases careful search should be made for any possible source of toxic infection. It will often be found in the mouth or intestine and if removed an amelioration or cessation of the recurring symptoms is to be expected.

Mr. A. J. WALTON.

Mr. H. W. CARSON.

[These contributions to the Discussion are printed in the *Lancet*, February 11, 1922, pp. 269, 278.]

¹ See *Brit. Med. Journ.*, February 4, 1922, p. 190.

Mr. J. E. ADAMS.

Two aspects of the treatment of gastric ulcer need consideration. First, the criteria of cure; and, secondly, the relationship between carcinoma and ulcer.

Some of the disappointments in these cases are no doubt due to dual control in their conduct, partly by the physician and partly by the surgeon. When we recognize that a third, and even a fourth party, a radiologist and a chemical pathologist, are needed to complete the diagnosis, I suggest that all these ought also to share in establishing the fact of cure. The physician thinks he has cured an ulcer when the patient returns to normal diet and customary habits of life without pain or discomfort. The surgeon is convinced that he has cured an ulcer if he excises it. But in view of the well-known fact that symptoms may be in abeyance for long periods, and that the crater of a chronic ulcer is not always in eruption, it seems to me that a reversal of all the diagnostic findings must be established before cure can be claimed. In my own cases I find that tenderness on pressure in the epigastrium is the most reliable physical sign and that this does disappear in those cases in which cure has apparently been effected by surgical measures. I find that the Polya resection yields the most satisfactory immediate results. Such patients will usually stand almost any pressure in this region. I should like to hear from physicians whether they find that medical treatment often abolishes this epigastric tenderness.

If special tests are required for diagnosis they are equally necessary at intervals in the after-care of the patient if cure is to be established and maintained.

I have several patients upon whom I have done a gastro-enterostomy who take their food perfectly well, but the fact that they still confess to some tenderness on epigastric pressure makes one hesitate to regard them as cured. A further case of interest is that of a woman aged about 40, whose stomach was so distorted and adherent that I diagnosed carcinoma, and owing to her feeble state I only removed a gland for microscopy. This proved to be non-malignant, and twelve months after the operation, futile as it was from a surgical point of view, that patient met me and thanked me most profusely for giving her a new lease of life. Although I divided a few adhesions and may have mobilized her stomach a little, in my opinion she is not cured but has reached a symptomless state; her health was good up to last Christmas; she is on full diet and doing her ordinary work as a housekeeper.

As to my second point I believe that the majority of surgeons who favour resection congratulate themselves, consciously or subconsciously, that they are removing a precancerous condition. Dr. Spilsbury has produced cogent arguments to prove that this is not so, but my own personal experience of four cases in which gastro-enterostomy for the relief of ulcer failed to protect the patient from dying of carcinoma of the stomach, inclines me to favour the more drastic partial gastrectomy for the treatment of chronic ulcer. Further, on looking up the records at St. Thomas's Hospital, I find that out of about forty cases of cancer of the stomach admitted each year usually one of them has had a previous gastro-enterostomy for what was thought to be simple chronic ulcer.

Excision by the Polya method, or some modification of it, does yield the most excellent immediate results and the post-operative course is not greatly different from that of a simple short-circuiting operation. It is not every

patient whose condition warrants such an operation and for this reason the surgical treatment of chronic gastric ulcer is not absolutely fixed and standardized. But whatever operation is done there can be no doubt that careful dietetic, and possibly medicinal, treatment is essential in the after-care of these patients. This is a matter which Mr. Sherren has most properly emphasized, and if this discussion leads to closer co-operation between medicine and surgery in the treatment of chronic gastric ulcer the time will indeed have been well spent.

Mr. GORDON TAYLOR.

Dr. E. P. POULTON.

Dr. G. NEWTON PITT (President).

[These contributions to the Discussion are printed in the *Lancet*, February 11, 1922, pp. 278, 279.]

Section of Medicine.

President—Dr. G. NEWTON PITT, O.B.E.

Abnormalities of Secretion in the Upper Alimentary Tract.

By T. IZOD BENNETT, M.D., and E. C. DODDS.

(ABSTRACT.)

[The main portion of this paper is published *in extenso* in the *Lancet*, 1922, i, p. 1138.]

THE authors described the technique which they employ for studying the acid and alkali secretions of the upper alimentary tract. By the fractional method of gastric analysis an estimate, more accurate than that given by any single-hour procedure, is made of the gastric secretion. Repeated estimates of the alveolar CO_2 tension confirm these findings and also give an estimate of the degree of secretion of alkaline juice by the pancreas in any given case.

After discussing certain physiological principles in connexion with these methods, the authors described the results of a series of experiments on the human subject which showed that the gastric and pancreatic secretions are both continuous in nature, and that such continuous secretions can be largely controlled by atropine applications to the local mucosa.

Having illustrated the pictures yielded by such methods in the normal subject they described the results they had obtained with pathological cases.

Conditions of true gastric hypersecretion they had found to be rare; they emphasized the infrequency of association of this condition with gastric ulcer, and showed that the laboratory picture typical of gastric ulcer is a highly concentrated gastric content rather than a true hypersecretion.

The steps were described by which they had reached the conclusion that an analogous condition of hypersecretion is found in connexion with the pancreas and that such a condition exists in diabetes mellitus.

Dealing with hyposecretory states they emphasized the frequency of achylia gastrica in normal men, and described a case of chronic pancreatitis; they then dealt with the hyposecretion seen in cases of pernicious anæmia, and brought forward evidence to show that the pancreas as well as the stomach is affected in this disease.

The last portion of the communication dealt with anomalies of secretion believed to be due chiefly to derangement of pyloric function, the chief examples being juxta-pyloric ulceration and carcinoma in the pyloric region.

Section of Medicine.

President—Dr. G. NEWTON PITT, O.B.E.

A Practical and Accurate Method of estimating Diuresis.

By P. L. VIOLLE (Vittel).

Chef de Laboratoire à l'Institut d'Hydrologie.

ALL mineral water diuretic therapeutics is controlled by two factors: (1) The condition of renal permeability and (2) the degree of portal tension. It is indeed on these two factors that diuresis depends. And diuresis is the essential object at which treatment aims. Therapeutic diuresis is characterized by:—

(1) An increase in the amount of water eliminated over that absorbed, that is to say, an *aqueous polyuria*.

(2) An increase of elimination of the extractive substances of the urine.

A study of these two features enables us to obtain information as to the manner in which diuresis is effected.

We have learned from the researches of Linossier and Lemoine¹ that there is such a thing as *orthostatic oliguria*, quite as much as *orthostatic albuminuria*. This delay in aqueous urinary elimination is an early sign of renal insufficiency. Horizontal decubitus is therefore indispensable for some patients in order to obtain any satisfactory elimination from their kidneys, while for others the upright position is indicated.

On the other hand, clinical examination has enabled us to refer the oliguria, supposing it to have been diagnosed, to its true cause, namely, diminution of renal permeability or "opsiuria," the result of portal hypertension. The absorption of water at the level of the intestinal mucosa, is, in fact, chiefly regulated by the portal tension, and the portal tension is controlled by the state of the liver. As to the gastric dilatation, it is easy to show when this is in evidence.

The hour at which the water is taken is also of great importance. The researches which I have undertaken² show with the utmost clearness the influence of digestion on diuresis. The fall in the diuresis after the meal is characteristic. Then, as before the midday meal, according to the conditions of the experiment, the average amount eliminated is 150 grammes; there is, however, a steep decline to 45 grammes during the four hours which follow the meal. Then the amount rises, starting from the fourth hour, and it attains about the previous level, to fall again after the seven o'clock meal exactly in the same way as after the midday meal. The maxima of the eliminations of nitrogen are during the fifth, sixth and seventh hours after the meals, whilst the maxima of the eliminations of chlorides are during the hours which precede the meals, that is to say, those at the greatest intervals from the latter.

¹ *Comptes-rend. Soc. de Biol.*, 1905, lviii, p. 691.

² P. L. Violle, *Comptes-rend. Soc. de Biol.*, December 10, 1921.

[May 23, 1922.]

When once the mode of posture in which the treatment should be carried out, and the time at which the water should be taken are decided upon, and the oliguria is referred to its true cause, there remains to be discovered how the kidney behaves, and what are the different modifications its functioning undergoes during the experiment.

In order to obtain this information as to the output of urine both from the point of view of quantity as well as from that of time throughout the whole duration of the treatment, I hand to each patient whose case appears to me to justify particularly detailed treatment a test-glass (*épreuve*) graduated from 500 c.c. and a short-necked bottle (*bocal*) graduated from 5 litres. I then order the patients, fasting from the previous evening, to empty their bladder completely, immediately before commencing their treatment each morning, and then from that moment, whether they have a desire to make water or no, to pass urine regularly every half hour; and, while noting the hour and the quantity of each of their specimens, only to leave the prone position, if they are being treated in bed, half an hour after drinking the last glass, then to discharge the urine, for the last time, into the graduated test-glass, but to continue to collect in the short-necked bottle the twenty-four hours' urine if this is necessary.

It is clear that the patient would be enabled to remain a much longer time in the position of dorsal decubitus, and the experiment be pursued over a more prolonged interval of time. In certain cases one would thus be able to obtain more complete information as to the further evolution of the diuresis. But, in a general way, one would be rapidly exceeding the "terms of reference" of the experiment which is, strictly speaking, that of forced elimination of water. The diuresis of treatment is a rapid phenomenon which comes to an abrupt termination. From the moment that there is delay in its production, and it begins to drag out, the functional value of the kidney has already been estimated in the majority of cases. That is why I have arranged that my method, in its employment, should extend over a very short space of time, limited to the period of absorption increased by half hour following.

The charts which I have plotted out are traced in such a way that the quantity of water eliminated, supposing it to be exactly the same as that absorbed, will be registered at precisely the same point, that is to say, that the first half hour marked for elimination corresponds to a period of time equal to one half hour after taking the same glass of water.

Thus, at one glance it is possible to determine:—

(1) The more or less considerable delay in elimination, by noticing the greater or lesser curve which forms, *below* the right line of absorption, the curved line of elimination.

(2) The more or less considerable diuresis obtained by the curve of the larger or smaller arc which the line of elimination forms *above* the right line of absorption.

Thanks to this method one can follow with considerable accuracy the manner in which the diuresis of the patient is effected, and thus obtain valuable information for the conduct of treatment.

Now, if setting aside all analytical research, we measure the diuretic power of a water by the difference between the quantity absorbed and that eliminated, it will first of all be seen that the diuretic action of the waters is not in proportion to the quantity of water absorbed; that, other things being equal, one obtains, alike in the normal as in the pathological cases, and at least in the majority of these cases, a diuresis proportionately more copious with small rather than with larger doses. For the rest, the solid diuresis diminishes if the polyuria exceeds a certain degree.

Mrs. M. is a typical patient from this point of view. She arrived at Vittel with an arterial tension very slightly above the normal; her kidneys appeared to be normal judging by the analyses made of her urine. There was slight tachycardia. She may be considered a normal subject. I gave her 400 grm. of water at the rate of 50 grm. every quarter of an hour. Her eliminations of urine amounted to 650 grm. of water. Then I gave her 1,000 grm. of water (100 grm. every quarter of an hour) and she secreted only 1,150 grm.).

The quantity of water most favourable for obtaining the greatest diuresis varies according to the patient, and in the course of the same treatment varies in the same individual. It is only by repeated, and as far as possible daily, study of their forced eliminations that one can establish the exact quantity necessary at a particular point of time.

No direct ratio has yet been noted between arterial tension and diuresis. But from a study of the majority of these charts certain general rules can be deduced.

Mr. L. arrived at Vittel with an arterial tension 18/10. He had very slight sluggishness in elimination and a fairly good diuresis with 500 grm. of water, which I gave him by doses of 50 grm. every quarter of an hour (*see fig. 1*). When after a lapse of some days the delay in elimination had completely disappeared and the eliminations had reached 850 grm. for the 500 grm. of water absorbed, I increased

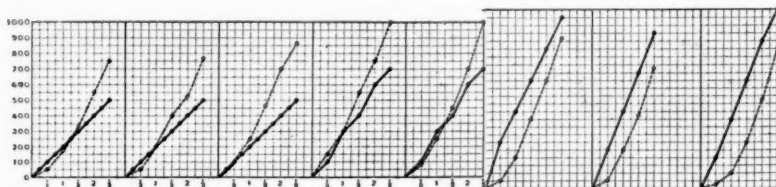


FIG. 1.

the quantity of water. I gave him 700 grm. by doses of 100-200-100-200-100 every half hour. I obtained an elimination of 1,000 grm. The next day, and the day following, the same results were obtained, that is, there was an increase of 300 grm. of elimination over absorption. Therefore, from a diuretic point of view, a result inferior to that obtained with 500 grm. I increased the dose and raised it to 1,000 and 1,100 grm. by doses of 300 and 200 grm. Supposing that the kidneys tolerate badly these very strong doses, or the sum total of these doses, I note a fall in the diuresis. Thus by varying the absorptions and noting the eliminations at equal spaces of time, strictly defined, and always the same as one another, I am able, with a full knowledge of the cause, to give that dose which is most favourable for obtaining the best diuresis possible at a particular point of time in the treatment.

Mrs. F. arrived at Vittel with a chronic nephritis of uræmic origin, with hypertension. Urea in the blood, 0.75; arterial tension, 17/10.5 (Pachon). I gave her 500 grm. of water by doses of 50 grm. every quarter of an hour (*see fig. 2*). I saw little by little her delay in elimination disappear and her diuresis increase, whilst at the same time her arterial tension became lowered. When the tension approached the normal, without changing the quantity of water absorbed, I increased the values of the different doses, spacing them, 100 grm. every half hour in place of 50 grm. every quarter of an hour, and I saw a progressive amelioration follow until the delay in elimination totally disappeared, whilst the diuresis took place with an increase of 200 grm. over the 500 grm. of water absorbed.

Mr. Br. had a renal impermeability which was much more accentuated. He arrived at Vittel with 7 grm. 2 of sugar per twenty-four hours, 1 grm. 50 albumin per litre, an Ambard's co-efficient equalling 0'12 and an arterial tension equal to 20/10'5. His delays in elimination slowly decreased, and his diuresis only commenced to be in evidence on the last day of his treatment. It is regrettable that this patient was unable to prolong his course of treatment at the station, as the readings of his chart warranted me to advise him to do.

Mr. Fr. was suffering from chronic nephritis of uræmic origin which had reached such a degree of renal impermeability as to bring him within the limits of contra-indication of the treatment. He arrived at Vittel with an arterial tension of 25/14 (Pachon); albumin, 1 grm. 50 per litre; Ambard's co-efficient, 0'27; continual headaches. I saw that diuresis was not forthcoming under the influence of the treatment. A slight increase in the doses of water set up an increase in delay of elimination. Nevertheless, this delay tended to diminish towards the end of the treatment, as if the renal impermeability was in spite of all slightly modified. And indeed I noted an improvement in the arterial tension (from 25/14 to 20/12'5); a lowering of the Ambard's co-efficient (from 0'27 to 0'20); a marked diminution in albumin (from 1 grm. 50 to 0 grm. 50); and prolonged remission in the attacks of headache, this latter point being of particular interest to the patient. Clearly it was impossible to alter his very rigid diet.

In conclusion, without too much prolonging this list of observations, I should like to mention the case of Mr. A., because he belonged to the type of those patients whom Dieulafoy designated by the term, both picturesque

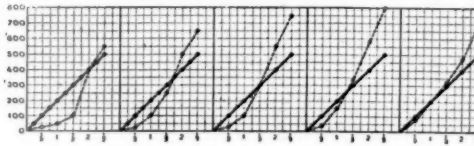


FIG. 2.

and correct, of "fragile baggage" (*colis fragile*), and also because that accuracy which a daily study of forced elimination of water has entailed has been of great service to me in the delicate conduct of this mode of treatment.

Mr. A. is a diabetic, but not emaciated. He arrived at Vittel with marked hyperglycæmia and a proportionately slight glycosuria; 55 grm. of sugar in his urine; a positive Gerhard's reaction; a very marked anæmia, between 7 and 11 per cent. hæmoglobin; an irreducible obesity; a slight arterial hypertension; attacks of asthma; continuous headaches; and in a state of considerable depression; and, finally, a marked insufficiency of renal elimination. For two years in succession he had tried the Vichy treatment in vain.

In fact, his whole clinical picture was dominated by insufficiency of renal eliminations. This insufficiency was the source of the remarkable disproportion between the glycæmia and the glycosuria. This it was which set up the retention of nitrogen and gave rise to the attacks of acidosis. It was also the cause of the hypertension and the headaches, and therefore the Vittel treatment was decided upon.

I gave him 500 grm. of water, in bed, by 50 grm. doses every quarter of an hour. The elimination curves of the first five days showed that the delay in his eliminations was gradually diminishing, and that of the last five days indicate that the delay in elimination no longer exists and that a marked diuresis has been established. Thanks to the establishment of this diuresis, Gerhard's reaction has disappeared; the sugar has fallen to 11 grm. per twenty-four hours; the arterial tension has become normal;

the headaches have disappeared, and his general state, partly perhaps on account of the foregoing findings, which are perceptible to the patient, has become infinitely better.

While this method of estimating diuresis is very interesting from the point of view of hydrology, it may also perhaps be advantageously employed by physicians not engaged in mineral-water treatment. It constitutes the simplest and most practical of medical methods of renal exploration. The hippuric acid method which I described in the *Lancet*, June 11, 1921, p. 1239, is much more complicated.

Whilst I was working under Professor Marcel Labbé at the Hôpital de la Charité, Paris, I systematically carried out this test of the measure of the diuresis in the case of all patients suffering from nephritis, in the following manner:—

The patient was given the same instructions as above recorded and was supplied with eight to ten glasses, into each of which he was requested to urinate every half hour, drinking at the beginning of each of the four first half hours 100 grm. of mineral diuretic water or of some diuretic decoction. It can thus be easily seen merely by looking the next morning at the ten glasses placed in a row near the bed of the patient whether there has been any delay in his diuresis or no. If there has not been any delay, starting with the third or fourth glass there will be the sudden appearance of a copious elimination of pale, clear urine which continues till it diminishes little by little. If it is wished to determine exactly the degree of trouble in elimination the quantity of urine contained in each glass should be measured and the chart plotted out in the way I have indicated.

In this way I have been enabled to bring into evidence the degree of various nephritic troubles, their amelioration or their aggravation.

In particular,¹ by means of analysis of the chlorides in each emission, I have been able to show that in cases of nephritis of dropsical origin with great retention of chlorides (the patient being on a chloride-free diet), whatever be the quantity of water eliminated, the kidneys can only pass a solution of NaCl of absolutely fixed concentration, the maximum concentration being invariable each day, but more or less variable from one day to another, according to the amelioration in, or aggravation of, the renal condition. It is only when the kidney again becomes freely permeable to chlorides that one begins to observe variations in the chloride rate of successive daily eliminations. In the healthy subject these variations amount to several grammes, according to the conditions of the experiment.

¹ *Comptes-rend. Soc. de Biologie*, 18 Fevr., 1922, p. 362.

Section of Medicine.

President—Dr. G. NEWTON PITT, O.B.E.

SUPPLEMENT TO THE DISCUSSION ON THE DIAGNOSIS OF GASTRIC ULCER.¹

The Morbid Anatomy and Histology of Gastric Ulcer, with Special Reference to its Relationship to Cancer of the Stomach.

By BERNARD H. SPILSBURY, M.B.

THE pathology of peptic ulceration of the stomach is similar in its essentials to that of chronic ulcerative processes elsewhere, and, as in those processes, the peptic ulcer has a structure which changes with every variation in the inflammatory reaction.

Systematic microscopical examination of peptic ulcers shows a progressive erosion of the stomach wall with extension of the inflammation in the base and margin of the ulcer, or a progressive healing with regeneration of the mucous membrane in the denuded area. The one process is generally present to the exclusion of the other and I have only rarely found indications of destruction and of regeneration in the same ulcer.

The digestive activity of the gastric secretion which bathes the ulcer, undoubtedly plays a very important part in maintaining the morbid process, whatever the factors may be which are responsible for its initiation; it is for that reason that the process is generally uniform throughout the ulcerated area. When the gastric function is very active, destructive processes are dominant and the ulcer enlarges; when the activity is reduced the progress is slower and the extension of the ulcer may be balanced by the contraction of scar tissue in its base: under these conditions the ulcer may undergo little alteration in size, with greater reduction of the gastric function processes of repair and of regeneration predominate, bringing about the contraction of the ulcer and healing.

When the relationship of peptic ulcer to cancer of the stomach is under consideration, the division of the morbid process into the two stages of destruction and of regeneration becomes one of practical importance: these two stages therefore form convenient divisions in the description of the peptic ulcer. In the actively destructive process the ulcer has a characteristic sharply cut or "punched-out" edge which is terraced, or funnel-shaped, owing to the outer coats undergoing less extensive destruction than the inner. The base is fairly smooth and is generally thin, with a liability to perforation; at this period there is no marked formation of inflammatory fibrous tissue in the ulcer, and there is no appreciable thickening and little induration of its margin. When the destructive process diminishes in activity, fibrous tissue

¹ See *Proceedings*, 1922, xv (Section of Medicine), p. 1.

[January 24, 1922.]

increases in amount in the ulcer; the margin loses the "punched-out" appearance and becomes rounded; it is also thickened and indurated.

Contraction of the fibrous tissue may produce a puckered appearance on the outer surface of the stomach in the area of ulceration; the extension of inflammation to the peritoneal coat brings about the formation of firm adhesions to the pancreas, liver, or other structure, with, it may be, extension of ulceration into these organs; contraction of the scar tissue may produce a pyloric stricture, and the gradual extension of ulceration from the lesser curvature, whilst the ulcer continues to contract, may result in the formation of an "hour-glass" stomach. The lymphatic glands along the lesser curvature are usually enlarged.

When pancreatic tissue forms the base of an ulcer the lobules of the gland may give the ulcer a slightly nodular surface. Arteries often project into the base of the peptic ulcer: an occluded vessel may traverse the base, or the projecting ends, when the middle portion has been destroyed; in fatalities from hæmatemesis the open end of an artery, or one which is closed by the recent formation of a thrombus, or a ruptured arterial aneurysm, will indicate the source of the hæmorrhage; the splenic artery is often implicated in rapidly fatal cases.

The destructive stage is seen in the post-mortem room in most of the cases in which a peptic ulcer is found in the stomach, especially when the ulcer is the cause of death, though many peptic ulcers found in the stomachs of those who have died from other diseases also exhibit these characters. This stage is also found in ulcers which are excised during emergency operations.

In the second stage, that of repair and regeneration, the ulcer becomes smaller as the result of the contraction of the scar tissue in its base and margin, the area of ulceration being reduced, the base becoming concave, and the edges approximating so that they overhang the base. The ulcer thus appears to become deeper, and the thickened and overhanging edge and small orifice may bring about the formation of a flask-shaped ulcer. This folding up of the ulcer is possible on account of the free mobility of the stomach, and it cannot take place if the ulcer is firmly bound down to a structure such as the pancreas. The thickening of the margin is also increased by local overgrowth of the mucous membrane, which has a velvety surface and a pink or bright red colour. The contraction of the area of ulceration produces lines of puckering which radiate in the stomach wall and persist round the small puckered scar which results from the completion of the processes of repair. This stage is seldom seen in the post-mortem room but it is found frequently in ulcers removed by the surgeon after a course of more or less prolonged medical treatment, and it is a testimony to the efficacy of the treatment that active processes of healing should so often be found.

These two stages have distinctive microscopical characters: in each stage the base and margin is composed of fibrous tissue containing fibroblasts in varying numbers and enclosing small aggregations of lymphocytes. The blood supply is scanty and the small arteries have thickened walls.

When ulceration is making active progress the mucous membrane at the margin of the ulcer shows degenerative changes and necrosis of the glandular and other structures in a narrow area, and necrosis is present in the inner part of the fibrous tissue forming the base.

When the rate of progress is reduced, the necrotic tissue is reduced in extent, fibrosis increases at the base and in the margin of the ulcer, and the surrounding mucous membrane is often thin and atrophic. So far there are

no microscopical changes pointing to processes of regeneration of the mucous membrane.

In the second stage, with the more active development of processes of repair, regenerative changes become evident. There is now no necrotic area of mucous membrane at the margin of the ulcer, but the glands show active cell proliferation: they increase in length, may become dilated, and sometimes show an irregular arrangement of the deeper cells; but they do not invade the submucous coat of the stomach unless that coat has been disorganized by the inflammatory process. The gastric glands also extend for a variable distance over the sides and base of the ulcer; the glands are short and are irregular in arrangement of their cells, and rest directly upon the scar tissue. It is probable that the majority of these glands undergo atrophy and disappear as the supporting tissue contracts and reduces their blood supply and the area for their attachment. At this stage there are commonly found at the edge of the ulcer gland cells which have penetrated deeply into the scar tissue and are cut off from the regenerating glands; they may exhibit an atypical glandular arrangement, or may form narrow solid columns of cells; isolated cells are also seen. It is these cells, detached from the regenerating epithelium and buried in the fibrous tissue of the ulcer, which are sometimes referred to as precancerous, and which from their position and irregular arrangement are regarded by others as indicating a malignant transformation in the ulcer.

It is owing to this interpretation having been placed on the cells by the investigators at the Mayo Clinic that they report a percentage of 68 of the presumed peptic ulcers removed by operation as showing microscopical evidence of malignancy.

The presence of displaced and buried epithelium is not peculiar to the healing peptic ulcer, but may be found whenever healing of chronic ulcers takes place in the skin and mucous membranes, and a close analogy will be found in the healing of chronic varicose ulcers of the leg. Squamous epithelium frequently becomes buried in the organizing granulation tissue at the margin of these ulcers. For a time it continues to grow but, becoming strangled by the scar tissue, it disappears; it may persist in the scar without giving any indication of its survival; it is only very occasionally that these cells can give origin to a carcinoma. There is reason to believe that the transformation of buried epithelium into cancer is correspondingly rare in peptic ulcers of the stomach.

If carcinoma develops in a peptic ulcer it must do so from the actively growing and regenerating mucous membrane at the margin of a healing ulcer or from the buried epithelium to which reference has been made. Such a carcinoma might spread from the margin into the tissue of the base of the ulcer, where it would traverse dense connective tissue poorly supplied with blood and having a precarious lymph flow, or it might spread into the normal stomach wall, where a loose arrangement of the tissues, abundant blood supply, and a free lymph flow would facilitate its spread. From our knowledge of the behaviour of carcinoma generally there can be no doubt that such a tumour would spread into the surrounding healthy tissues far more readily than into the scar tissue in the ulcer. The ulcer, therefore, will exhibit the structure of a peptic ulcer, but with more pronounced thickening of the margin on one side, the thickening extending for some distance into the surrounding tissues; there may be superficial ulceration in the thickened area, or the growth may fungate, forming polypoid or large irregular soft tumours; beyond the apparent margin of the tumour separate nodules may be found in the stomach wall.

On microscopical examination the bulk of the original peptic ulcer will be found to consist only of fibrous tissue, and to be free from cancer.

These ulcers are encountered occasionally, and have been described by various authors, who have attributed them, I believe correctly, to malignant transformation in a peptic ulcer. Those authors, such as Ewing, who have adopted this criterion estimate that certainly not more than 5 per cent. of peptic ulcers of the stomach, and probably not more than 1 or 2 per cent., develop secondary malignant disease. The high percentage of malignant transformations which is given by others is accounted for in part by their having mistaken processes of irregular regeneration for evidence of malignancy. Even bulky malignant growths tend to respect the scar tissue of a preceding peptic ulcer.

A large proportion of cancers of the stomach undergo secondary necrosis and ulceration; in most of these tumours the thick layer of growth, usually soft, which forms the base of the ulcer, and the wide extension of the tumour in the surrounding tissues, clearly indicate that ulceration is a secondary event in the development of the cancer, and is not the remains of a peptic ulcer.

There are slowly growing cancers of the stomach of a dense scirrhus type which exhibit diffuse infiltration with thickening and contraction of the stomach wall; these form a well recognized group to which the designation "linitis plastica" has been given. This variety of growth may form a localized tumour in the stomach. When it undergoes extensive ulceration the tumour may closely simulate a peptic ulcer in its gross structure; some authors include these tumours in the group of cancers arising from peptic ulcers. It is this type of cancer which renders it so important that all presumed peptic ulcers of the stomach should be submitted to microscopical examination.

When it is found that the dense fibrous tissue in the base of the ulcer is infiltrated everywhere by cancer cells, we should, I submit, regard such a tumour as a primary cancer with secondary ulceration.

Malignant change in peptic ulcer of the stomach has been considered, so far, from the point of view only of morbid anatomy and histology, but when statistics bearing upon the relation between the two processes are taken into consideration—the very different age incidence of peptic ulcer and carcinoma of the stomach, the difference in distribution of the two conditions in the stomach (the pylorus being the site of origin of 60 per cent. of all gastric cancers, but of only 12 per cent. of the peptic ulcers (R. Williams), whilst in the lesser curvature are found 36 per cent. of the peptic ulcers, but only 12 per cent. of the gastric cancers), the very rare association of cancer with peptic ulcer in the duodenum—we have such an array of arguments against any frequent association of cancer with peptic ulcer of the stomach as to lend strong support to the contention that malignant transformation of a peptic ulcer must be an uncommon event.

Dr. J. H. RYFFEL.

I propose to confine my attention to the fractional test meal, in which samples are removed from the stomach before and at fifteen-minute intervals after the ingestion of the meal, by means of a small tube with a perforated metal end, which the patient swallows. The risk of accidental bleeding is small, especially if Ryle's modification of Einhorn's tube is used. For the test meal a pint of strained oatmeal gruel has the advantage of being nearly

colourless, so that titration of the samples is easier and any tint there may be is recognized as due to the presence of either bile or blood. For titration of the samples, phenol-phthalein and Töpfer's reagent have usually been employed as indicators. Cole and Adie have more recently recommended thymol-blue in place of Töpfer's reagent. This is certainly more accurate for arriving at the quantity of free HCl, but, as most observations have been made with Töpfer's reagent, the change is unfortunate. Correcting, however, for the fact that the standard end-point with thymol-blue is at $\frac{N}{100}$ HCl, the results of the two indicators do not differ materially unless the sample is rich in protein products, when Töpfer gives distinctly high results.

The figures obtained are plotted as a curve showing the relation between the acidity and the time that has elapsed since the taking of the meal. These curves may be arranged in four groups:—

(1) Those in which the curve of acidity falls within normal limits, the material of the meal having passed on within two and a half hours as shown by the disappearance of starch and sugar from the samples, while the free HCl rarely rises above $\frac{4N}{100}$ HCl and reaches its maximum at about one and a quarter hours. This group includes gastric ulcers and some cases of gastric carcinoma.

(2) Those in which there is little or no free HCl developed, and no delay in emptying. This includes the majority of gastric carcinomas without obstruction, and cases of achylia gastrica and marked hypochlorhydria.

(3) Those in which there is delay in emptying with a corresponding gradual rise in acidity. This includes ulcers, whether gastric or duodenal, in which there is spasm or stenosis of the pylorus, carcinoma of the pylorus, in which free HCl may be present or absent but is lower on the whole than in ulcer, and gastroparesis in which free HCl is present but develops slowly.

(4) Those in which free HCl rises rapidly to abnormally high values, the stomach emptying rather more rapidly than in normal cases. This is the duodenal type where there is no spasm or stenosis of the pylorus.

Except in cases of carcinoma of the pylorus when there happens to be no free HCl and there is marked development of lactic acid, there is no absolutely distinctive curve. Further differentiation is arrived at by examining for bleeding. If blood is definitely present in the whole series of samples this is sufficient evidence of ulceration whether simple or malignant, but in simple ulcer this is often not the case and accidental bleeding is sometimes troublesome, so that examination of the faeces for blood is necessary. This should be done on a fairly large scale with thorough extraction, so that the extract can be examined spectroscopically for acid hæmatin and for hæmatoporphyrin. If acid hæmatin is recognized the amount of blood is relatively large. Hæmatoporphyrin is free from iron, so that its recognition is complementary to other tests. As far as I have seen, hæmatoporphyrin does not occur appreciably in the faeces of normal people on ordinary full diet, and acid hæmatin is certainly never visible normally.

As to the results, blood in the faeces is variable in gastric ulcer, more consistently present in duodenal ulcer, and practically universal in pyloric ulcer and carcinoma ventriculi.

Section of Medicine.

President—Dr. G. NEWTON PITT, O.B.E.

SUPPLEMENT TO THE DISCUSSION ON THE TREATMENT OF GASTRIC ULCER.¹

Mr. JAMES SHERREN.

It is customary to recognize two stages of gastric ulcer, the acute and the chronic. Although it is difficult to define exactly their boundary or their exact relationship it is convenient to discuss them in this way, for the acute ulcer, apart from its complications, cannot be definitely diagnosed by any means at our disposal; the chronic, however, particularly in men in whom it is so much more common, the correct diagnosis can often be deduced from the history and, in both sexes, made certain by demonstration on X-ray examination, after an opaque meal, of the changes which it has produced in the gastric wall. Such a division is important also from the point of view of treatment, the acute, rarely, the chronic ulcer usually, requiring operation.

That acute ulcers result from infection I believe to be proved, equally certain is it that if the cause can be removed and suitable treatment adopted, healing will take place without surgical interference with the stomach.

Except when perforation has occurred an operation upon the stomach has no place in the treatment of acute ulcer. Most important is removal of all sources of infection, particular attention being paid to the mouth and pharynx. In my experience this has often been neglected; it is not uncommon to have to delay operation in old-standing cases of chronic ulcer until teeth have been treated that should have been dealt with many years previously. At this stage infected teeth are removed to lessen the risk of post-operative complications; it cannot be expected to influence a well-established ulcer that has penetrated through all the coats of the stomach and perhaps involved the pancreas or liver. This needs to be emphasized; it has been my unfortunate experience to meet with an increasing number of chronic cases in which this has been done for treatment and the necessary, long overdue operation delayed until malignancy has supervened.

Rest in bed is essential; I am sceptical about the possibility of efficient ambulatory treatment of gastric ulcer. Rest in bed, suitable diet and controlling gastric acidity will bring relief in cases of acute ulcer and cure if the cause can be discovered. If relapse occurs after efficient medical treatment the case should be considered surgically and exploration undertaken with a view to the discovery of any possible cause of intra-abdominal infection.

In the face of perforation immediate operation is, of course, necessary. The fact that an ulcer perforates does not mean that it is necessarily an acute one; contrary to the usual teaching it is more often chronic. Among 248 consecutive cases of perforated gastric ulcer admitted to the London

¹ See *Proceedings*, 1922, xv (Section of Medicine), p. 9.

[February 2, 1922.]

Hospital in the last ten years, only eighty-seven were of the acute variety. In dealing with perforation of an acute ulcer, if the condition of the patient will permit, search should be made for sources of intra-abdominal infection but gastro-jejunostomy should never be done. After operation, the treatment should continue on the lines laid down, remembering the frequency with which acute ulcers are multiple.

Hæmorrhage from an acute ulcer does not call for operative treatment and I would remind you that hæmatemesis is more often met with in cases in which it may be extremely difficult to demonstrate any ulceration.

When an ulcer has reached the chronic stage I am not convinced of its curability apart from operation. In considering treatment the fact that it is undoubtedly a pre-cancerous condition has a definite bearing. We are not able to trace directly the development of carcinoma from chronic gastric ulcer; it is by no means uncommon, however, to find on microscopic examination of ulcers removed at operation, that, although the greater part is simple, definite malignant growth has started at one edge. It is often quite impossible to determine the nature of an ulcer from its naked-eye appearance. This, together with the frequency with which patients come for surgical treatment with inoperable carcinoma, after a long period of attacks sufficiently definite to have enabled the diagnosis of ulcer to be made, is to me ample warrant for this opinion.

I am convinced that the efficient management of acute ulcer and the early operative treatment of chronic, will greatly diminish, if it will not entirely abolish, the incidence of carcinoma of the stomach.

There are two further facts to consider—direct treatment alone, i.e., excision of the ulcer or sleeve resection of a portion of the stomach, has failed to cure many and the relapse rate is high; indirect treatment, gastro-jejunostomy, when correctly performed to the cardiac side of the ulcer, promotes healing of all free simple ulcers and carries with it even less than the small liability to secondary ulceration in the region of the anastomosis that is met with after a similar operation for duodenal ulcer. In view, however, of the impossibility of deciding if any ulcer, however small, is malignant, operation should consist in removal of the ulcer combined with gastro-jejunostomy. Small ulcers can be destroyed most easily with the cautery (Balfour's method). Large indurated ulcers or those which have perforated and whose floor is formed of neighbouring organs should be treated by partial gastrectomy, closing the cut end of the duodenum and uniting the jejunum to the cut surface of the stomach; this is a most satisfactory operation.

The occurrence of stricture in the body of the stomach (hour-glass stomach) or at the pylorus, does not call for any different line of procedure, the condition of the ulcer, not the mechanical effect it has produced, should be the governing factor in treatment. The term "hour-glass stomach" seems to have had an almost hypnotic effect upon some surgeons who have devoted time and ingenuity in dealing with the mechanical condition and not its underlying cause; plastic operations are unnecessary and often unsuccessful. The majority of cases are most satisfactorily treated by partial gastrectomy. Those with coincident obstruction at the pyloric region from the cicatrization of a duodenal ulcer should be treated in the same way if this is feasible. Gastro-jejunostomy, double if the condition is complicated by pyloric stenosis, may be carried out with a good prognosis if the state of the patient does not permit of more radical measures. Gastro-jejunostomy may, however, be very difficult, mechanically imperfect and lead to vomiting if the cardiac pouch is small.

When a chronic ulcer perforates, the immediate indication is to close the opening; if the condition of the patient will permit, the treatment appropriate to the ulcer should be carried out. If this is impossible it should be done three months later. If this is neglected, a second perforation of a chronic ulcer is by no means uncommon, for closure of a perforation of such an ulcer is even less likely to lead to cure than excision.

Hæmorrhage is a very dangerous complication in chronic ulcer. Usually coming from an artery in its floor, it is comparable to secondary hæmorrhage. If there is a suspicion, from the history, that the ulcer from which the bleeding is proceeding is chronic, operation should be carried out as soon after the first bleeding as the patient's condition will admit; this is usually in thirty-six to forty-eight hours; the patient meanwhile being kept under morphia and given rectal salines.

The bleeding point must be dealt with directly and the ulcer treated; the exact operation must vary with the condition of the patient but it is unusual to find that destruction by cautery and gastro-jejunostomy cannot be carried out.

In conclusion, the treatment of gastric ulcer, in its early or acute stage, consists in dealing with infection and controlling the composition of the gastric contents. Failure to cure by medical means is the indication for operation.

In chronic ulcer the quickest and safest method of treatment is operative and it should ever be borne in mind that chronic gastric ulcer is a precancerous condition.

The surgeon must remember to impress on the patient that care must be exercised in diet for at least three months and time allowed for the jejunum to become accustomed to its mechanically abnormal contents.

Although the treatment of chronic gastric ulcer by operation is at the present time the most rapid and successful method, I look forward to the time when early recognition of its cause will abolish the need for measures which, although restoring the patient to health, materially alter the physiology of digestion.

DR. A. BERTRAM SOLTAU.

In the discussion the infective origin of gastric ulcer has been emphasized, or at any rate the possibility that it does not necessarily originate from a local cause in the stomach, but may result either from swallowed bacteria or toxins, or, by means of the blood stream, from some distant infective focus. This point should constantly be borne in mind, and those engaged in teaching should particularly inculcate its importance. Gastric ulcer is not necessarily, or even frequently, an isolated lesion, but often only one expression of an infective process.

As regards treatment, there is general agreement that certain types of case require operation, including both those cases with repeated hæmorrhage which threaten life, and those with persistent relapses despite careful treatment and dieting. Probably we are also equally in agreement that the acute peptic ulcer is essentially a medical problem, for such an ulcer should invariably be cured by, and remained cured under, medical treatment.

Whether or not the chronic ulcer—the "B" ulcer as it has been termed—is the same type of lesion as the acute is a very difficult problem to determine. Personally, I am inclined to regard them as two distinct entities. I have not often found that the chronic ulcer occurring in the fourth decade of life is preceded by any history suggestive of the acute ulcer in earlier life. It is not

likely that such an occurrence as an acute ulcer will have been forgotten, for its dominant symptom is pain, and that is the one symptom the memory of which is ineffaceable in the patient. The treatment of the chronic ulcer is the debateable ground upon which physicians and surgeons meet in conflict and disagreement. The object of this meeting is not to hear the results which special surgeons or physicians have obtained, but rather to determine a rational line of treatment which can be followed by the mass of the profession.

The chronic ulcer should at first be treated on general medical principles. At what point should such treatment be despaired of? How many relapses should be allowed before the physician confesses that the case is beyond him? As a partial answer to this question I suggest that it depends upon the economic position of the patient. Undoubtedly it is possible, if not to cure, yet to render life reasonably safe and comfortable, by constant care in dieting and treatment for those who are in easy circumstances and not dependent on their efforts for a livelihood. Those, however, who are condemned to a wage-earning existence cannot take the required care of themselves, and for these an operation is more necessary. At the best, twelve months are needed to secure a reasonably good result in these cases, and if such a period of time be not available it seems wiser to advocate an early operation.

Operation, however, must not be embarked upon in a light-hearted way. Whilst published statistics and surgical literature suggest the fact of a very large measure of success, it would be folly to suppose that, leaving aside the operation mortality, the end-results are uniformly successful. In practice I know of a lamentable number of cases which have not been bettered by operation, but have continued to suffer from pain, wasting and vomiting. This is due in part to faulty diagnosis, to operation on an atonic stomach possibly not ulcerated at all, to errors of technique, to failure to remove the distant infecting focus, and particularly to faulty after-treatment. It is so easy to assure a patient that operation will cure him, and yet to forget that operation is only an incident, and not always the important one, in the treatment. The psychological side of the question must be remembered,—the fact that an operation inflicts a mental trauma on the patient, which takes months to heal, and that during that period he needs continual care. The surgeon must either be prepared to bestow this care or to hand the case over to a physician. Too often the demarcation between medicine and surgery is emphasized. Students must be taught that a case is not medical or surgical according to the accident of the ward receiving him, and that meticulous attention to details of treatment is as essential in after-treatment as in the ritual of the operating theatre.

The difficult problem we are discussing to-day will only rightly be solved by team-work, in which the physician, the surgeon, the radiologist and the pathologist are united in endeavour, instead of appearing to be in opposing camps.

Mr. H. W. CARSON.

At stated intervals I review the results of my gastric operations in order to get in touch with my old patients, and thus obtain some idea of my results. Late complications, if they occur, will probably be established in two years, and indeed there will be indications of coming trouble in six months.

The last period of review embraced 118 consecutive cases, of which fifty-one were gastric, sixty-four were duodenal, and in three there were ulcers

both in stomach and duodenum. Of the fifty-one gastric ulcers twenty-eight, or 55 per cent., were lesser curve ulcers, and twenty-three, or 45 per cent., were pre-pyloric or pyloric ulcers.

The lesser-curve ulcers were equally divided between male and female, the pyloric and pre-pyloric ulcers affected thirteen females as against ten males, and the duodenal ulcers occurred in the two sexes in a proportion of forty-nine males to fifteen females; so that, of the whole series of 118, what one may call the juxta-pyloric ulcers, accounted for eighty-seven, or 74 per cent., while the lesser-curve ulcers accounted for twenty-eight, or 24 per cent., the other 2 per cent. being made up of the three cases of multiple ulcer.

My surgery of gastric ulcer shows a gradual transition from doing gastro-enterostomy for practically all cases of gastric ulcers to the present position. This is due to the fact that until more radical treatment was adopted I could not get better than 60 per cent. perfect results in gastric as against 81 per cent. in duodenal ulcer. On looking into the cases I found that of the 60 per cent. the greater number were pre-pyloric or pyloric cases, and that lesser-curvature cases gave me no better than 40 per cent. cures. My first step was to do excisions of lesser-curvature ulcers sometimes with, but generally without, gastro-enterostomy. These cases showed an improvement on the gastro-enterostomy results, but I had a mortality of about 8 per cent., and in one or two cases there were return ulcers. Considering that these ulcers are probably secondary to some septic focus elsewhere, it is to be expected that they will return if the septic focus is not discovered.

I put my patients through an exhaustive examination: throat, nose, teeth, tonsils, appendix, gall-bladder are all examined, but, likely enough, the focus is not discovered in a certain proportion. I then became interested in Balfour's operation, but though it is a good thing to destroy the ulcer, the accompanying gastro-enterostomy is illogical if one believes it to be useless in lesser-curve ulcer, and I therefore hardly ever do it now. Then about four years ago I adopted some form of partial gastrectomy, at first sleeve resection in selected cases, and I was, and still am, very satisfied with the results. But its scope is limited to ulcers in the centre of the lesser curve (i.e., with plenty of room on either side for section and end-to-end anastomosis) and the simpler form of hour-glass contraction. The next step was to do Billroth's second method for lesser-curvature ulcers, and as a natural sequence the Polya operation, modified as recommended by Moynihan.

The effect of this is that I am doing less and less gastro-enterostomy for gastric ulcer. I restrict the operation entirely to a proportion of the pre-pyloric and pyloric ulcers. As a matter of interest I did not do one gastro-enterostomy for gastric ulcer last year because all my cases required, or I thought they required, more radical measures, but I have done it twice already this year. By the adoption of these more radical measures I have improved my gastric results to 83 per cent. perfect, that is about the same as duodenal ulcer results.

There is not so much to say about juxta-pyloric ulcers. I am content to do gastro-enterostomy for these unless the ulcer is very large or of doubtful innocence, in which case I do a partial gastrectomy by the Polya-Moynihan method or Billroth's second method.

The really difficult ulcer is the chronic lesser curvature ulcer, which has progressed to the saddle-ulcer stage or has become adherent to the pancreas. Those situated near the œsophagus are especially difficult to deal with. I have had two of these during the last year, and treated one by the cautery, the other

by excision, with at any rate an operative success. For these saddle ulcers and adherent ulcers I adopt the Lardennois-Pauchet approach through the posterior attachment of the great omentum to the transverse colon, opening the lesser sac and stripping the colon away at the same time; it seems to give the clearest view of the adhesion and makes separation fairly easy, and at the same time safeguards the middle colic vessels.

I am certain that a partial gastrectomy is the only treatment for such cases. It will be found generally that the affected area of the stomach is too extensive for a sleeve resection, and the Polya-Moynihan method is the method of choice because you can do it when Billroth's second method is impossible. The immediate result of this extensive operation is really remarkable. Patients make a much more rapid recovery than after gastro-enterostomy, and their return to normal health is quicker. I hold the view that if the ulcer is left behind it should be considered unhealed for six months, and during that time the patient must restrict his diet and take alkalis. After partial gastrectomy I do not think this is necessary, and I allow them to resume their ordinary dietetic life about two months after operation. I have no doubt that the removal of a big pus-forming crater has an immediate effect on the patient's well-being and early recovery.

Treatment of Complications.—Hour-glass stomach depends for its treatment on whether the ulcer is active or not. In the presence of active ulceration I am strongly opposed to purely plastic operation. If the hour-glass contraction has resulted from the scarring and contraction of a healed ulcer, and if the pylorus is patent, any of the plastic methods in vogue may be done, but if ulceration is proceeding, radical methods must be adopted. If I can do it I like to do a sleeve resection; if not possible, a partial gastrectomy.

Perforation.—I prefer the least possible operation. I do not excise the ulcer, nor do I do a gastro-enterostomy, nor do I wash out the peritoneal cavity. I am content to sew up the perforation, infold it, and drain the pelvis through a suprapubic wound, using no drain in the upper abdomen.

Hæmorrhage.—In chronic ulcer I operate after one serious hæmorrhage.

Post-operative Complications.—Among the immediate complications are hæmorrhage, acute dilatation of the stomach, and vicious circle. I have been fortunate in never having had a patient die of hæmorrhage after operation, nor have I had to re-operate for that complication. I have had two cases of acute dilatation in my sixteen years' experience of gastric surgery, and both did well. There had been four cases of vicious circle, all except one in my early cases, but the last was in September, 1919. All recovered after entero-anastomosis.

Late Complications.—As stated above, I have had a few cases of recurrent ulcer in the scar after excision, and I have operated upon four cases of gastro-jejunal ulcer, in three of which I did the original operation (gastro-enterostomy for duodenal ulcer). I believe that if complications are going to occur, they will develop within two years; indeed I think there will be indications within six months.

Immediate Results.—There is no doubt that if we exclude cancer cases, gastric operations are attended by a very low mortality. In these fifty-four consecutive cases of operation for gastric ulcer, in twenty-nine of which some form of partial gastrectomy was done, one case died after excision of a huge lesser-curvature ulcer. The patient was very wasted and feeble, and I think was probably unsuitable for any operation. During that period I have operated on sixty-four duodenal ulcers with three deaths (all operated on for severe

hæmorrhage from the ulcer). Gastro-jejunostomy is very safe, my best run being 105 without a death. I believe my results for gastro-enterostomy, all cases excluding cancer, come out at 2·5 per cent. mortality.

MR. GORDON-TAYLOR.

I have been until recently a strong advocate of partial gastrectomy in all cases of gastric ulcer, but I now reserve that treatment for large ulcers, especially when they cause hæmorrhage.

For the smaller ulcers I have reverted to practising gastro-enterostomy, with or without excision of the ulcer.

When operating for hæmorrhage, I attach great importance to blood transfusion before or during—or both before and during—the operation. When transfusion is performed it is possible to operate successfully during the progress of the hæmorrhage.

When operating for perforation I always perform gastro-enterostomy in addition to suturing the perforation; I have been led to do this by the recurrence of perforation in three cases in which simple suture had been performed.¹

¹ Up to the present date (September, 1922) I have operated upon seventy-two cases of gastric ulcer, with six deaths.

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Section of Neurology.

President—Mr. PERCY SARGENT, C.M.G., D.S.O., F.R.C.S.

PRESIDENT'S ADDRESS:

Some Observations on Epilepsy.

By PERCY SARGENT, C.M.G., D.S.O., F.R.C.S.

IN those affections of the nervous system to which surgical measures are applicable, the physician is chiefly concerned with diagnosis, whilst the surgeon must pay particular attention to the technical problems which operative treatment presents. Neither is fitted by training or experience to perform in these respects the functions of the other. I take the opportunity of touching upon this subject in view of the well-known opinion held by Harvey Cushing that the surgeon who concerns himself with operating upon the nervous system should be his own neurologist. However attractive this may be in theory, it can never, to my mind, attain practical realization, for just as a wide knowledge of general medicine is essential to the neurologist, so is an intimate acquaintance with general surgery desirable for one who takes seriously that part of general surgery which concerns itself with the nervous system. The acquisition of this familiarity with all branches of surgery leaves but scant time for the laborious and exacting work, both at the bedside and in the laboratory, which the training of a neurologist demands. I hold that the nervous system is not a suitable field for surgical specialism in the more restricted sense of the term.

The co-operation of neurologist and surgeon is not only of value in the diagnosis and treatment of certain diseases of the nervous system, but it also affords opportunities for the study of what Moynihan has called the Pathology of the Living. Neurology has already gained much from observations made in the operating theatre, and far more may be confidently expected in the future. The mere exposure of the cortex, the removal of tumours, section of nerve roots and other manipulations reveal phenomena which can be observed neither at the bedside nor by post-mortem examination. In more senses than one the operating theatre may be made a link between the ward and the post-mortem room. When a physician fails to witness the operations which are performed upon his patients, he not only neglects a fruitful source of information for his own future guidance, but he also deprives the surgeon of the very great advantages which accrue from consultation upon questions which may arise during the course of an operation.

In his Presidential Address to the Neurological Society in 1902, Herbert Page said: "I venture to take up the position that surgery may be even bolder than it has hitherto been in endeavouring to minimize and remove some of the causes which seem to be at the root of the later consequences of severe head injury." Among these later consequences the occurrence of

epileptiform seizures stands out prominently, more so than ever before, by reason of the large number of sufferers from epilepsy resulting from cranio-cerebral wounds.

Having had to deal with many such patients during the past three or four years, I have been increasingly impressed by the feeling that surgical procedures for the treatment of epilepsy are greatly hampered by the obscurity which still exists as to the essential factors that underlie convulsive attacks in general.

James Taylor has recently reminded us that in regarding epilepsy as a disease, there is some danger of losing sight of its purely symptomatic aspect, and has emphasized the desirability of searching in every case for the physical basis which forms the starting point of the convulsive seizures. He contends that the attempt to enmesh epilepsy in the net of psycho-analysis represents a definitely retrograde movement, whilst any real step forward in the elucidation of the nature of "ordinary epilepsy" is to be made from a study of Jacksonian attacks.

Gowers said that a tumour or spicule of bone could "so train the whole brain into a habit of discharge that the attacks differ little from those of idiopathic epilepsy." Instead, however, of merely seeking to reconcile the convulsive seizures of known focal origin with those of idiopathic epilepsy, we should rather approach the problem from the opposite point of view, realizing that in idiopathic epilepsy we have phenomena unassociated with any obvious cause, which may yet be in all respects identical with those which occur in connexion with gross lesions, from the damp-squib effort of *petit mal* to the full pyrotechnic display of a major attack. Further, we must remember that between ordinary epileptic fits and focal fits associated with visible lesions there exists a bridge in the form of attacks of a Jacksonian character in which no gross lesion appears to exist.

Surgery would be in a better position to play its part in the treatment of epilepsy, whether or not of focal origin, if we knew more of the factors underlying the phenomena of a fit; and if we could recognize any essential precipitating cause common to all forms.

I would not presume to criticize the various views as to the pathogenesis of epilepsy which have been advanced in the past, or which are at present entertained. I should like, however, very briefly to examine what is known as the vascular hypothesis, because during the frequent opportunities which I have had of viewing the living brain, under both normal and abnormal conditions, I have been greatly impressed by the striking rapidity with which visible circulatory changes may occur in response to various disturbing causes. I cannot help feeling that sufficient importance is not attached to the possible effects upon cerebral function of what may perhaps be called minor and transitory circulatory disturbances. It is not upon the congestion or anæmia of the brain as a whole that I would lay stress, but upon the local variations and abnormalities which can be observed in connexion with tumours and various traumatic lesions. It seems to me that the only local influence which an operation can have upon an epileptogenous area, short of excising that portion of the cortex, must be exercised through the medium of the local circulation. If there is a fundamental precipitating cause for all convulsive attacks, any hypothesis which does not take into account the pathogenesis of fits originating in the neighbourhood of a gross lesion must fail to touch that essential point.

Gowers, discussing the pathology of idiopathic epilepsy in 1900, wrote

"The conceptions of epilepsy which have been current during the last forty or fifty years . . . are not much more instructive than the old demoniacal pathology which gave the disease its name." One such conception he specified, namely, that "the epileptic fit was the result of a spasm of the arteries of the brain," and went on to remark that this notion had disappeared absolutely before the simple but conclusive facts which connected the manifestations of the disease with a morbid state of the cortex. It is noteworthy, however, that, some years later, in the "Borderland of Epilepsy," he admitted the possibility of cerebral vaso-constriction in relation to vaso-vagal attacks. But the view that the phenomena of epilepsy result from disordered cortical function does not by any means necessitate relinquishing all belief in an underlying vascular disturbance.

On the contrary, both the "morbid state of the cortex" postulated by Gowers, and the "spasm of the arteries of the brain" denied by him, may conceivably be concerned together.

The whole subject of the relation of disorders of the cerebral circulation to convulsive attacks, as well as to loss of consciousness and other clinical manifestations, was fully discussed by A. E. Russell in his Goulstonian Lectures in 1909. To these lectures I have long been indebted for suggestions and references bearing upon the very interesting and important question of the relationship between gross cerebral lesions and epilepsy. For it is obvious that in operating upon epileptics, and in choosing cases for operation, we should like to have a clear idea of the purpose of the operation, based upon some reasonable conception of that relationship. The surgeon who merely removes a disc of bone from the cranium of an epileptic patient places himself on a level with the practitioner of the Stone Age, the marks of whose handiwork upon the skulls, probably of the epileptic or the insane, are to be seen in museums of ethnology.

The thesis which Russell developed from a mass of clinical evidence was that the common factor underlying many disturbances of cerebral function is to be found in some disorder of the cerebral circulation. It is interesting to note, in view of the trend of recent research, that as long as twelve years ago he hinted that, so far as the causation of epilepsy at least is concerned, inquiry into the processes, both nervous and chemical, by which the cardio-vascular apparatus is governed, might afford a valuable clue. He further drew attention to a similarity between experimental decerebrate rigidity and the tonic spasms occasionally observed in cases of sudden complete arrest of the cerebral circulation.

In most writings upon epilepsy such expressions as "sudden discharge of nerve force," "sudden liberation of energy," and "explosion of nervous energy" are commonly found. Such terms, if they relate to the cortex alone, can only mean that the fit is to be looked upon as a manifestation of excessive cortical activity. It is impossible, however, to regard loss of consciousness, one of the most sudden and striking events, and often the only recognizable event in an epileptic fit, as a manifestation of the discharge of nervous energy.

A sudden failure of the cerebral circulation is inevitably followed by loss of consciousness, and we know that it can also produce convulsive movements, as seen in the attacks associated with the condition known as "heart block." It is inconceivable that a sudden arrest of the cortical circulation can, at one and the same time, bring about both a suppression and an augmentation of function. When loss of consciousness and convulsive movements result from the same cause, we can only believe that those movements point to a suspension

and not a stimulation of cortical activity. The tonic stage of muscular contraction appears to indicate, not a discharge of nervous energy from the cortex, but the liberation of a lower level motor mechanism from cortical control. In a word, the unconscious rigid epileptic is, for the moment, a decerebrate man.

In a recent paper Kinnier Wilson has brought forward clinical evidence to show that decerebrate rigidity, both with and without the occurrence of tonic fits, occurs in man as the result of lesions which interrupt the cortico-spinal path, and that such rigidity is strictly comparable with that which obtains in animals when the mesencephalon has been transected. He points out that lesions which have not the completeness of the experimental section find expression in rigidities of limited scope, and that even functional interruption of cortical control may be manifested by a similar sequence of events. It requires no great effort of imagination to suppose that cortical control may be suddenly and momentarily cut off by a sudden and transient disorder of the cortical circulation, and cause varying degrees of decerebrate rigidity according to the extent and duration of the circulatory disturbance.

Whilst a state of momentary decerebration may be held to explain the tonic stage of an epileptic fit, it is not so easy to account for the clonic movements. Kinnier Wilson, in the paper alluded to, having characterized the tonic fits observed in the cases which he was describing as "attacks of decerebration," remarks that the absence of any clonic movement is of much significance. He takes it to indicate that tonic and clonic movements have different origins, and are the expression of the activity of different motor mechanism, the one being characterized by static, and the other by phasic activity.

In a few recorded cases an epileptic fit has occurred during actual examination of the heart or radial pulse. The tonic stage has coincided with the sudden arrest of the circulation, whilst the clonic stage has commenced with the return of the circulation. In cases such as Russell's in which sudden and permanent arrest of the circulation was immediately followed by tonic spasm, no clonic movements were observed.

It can hardly be doubted that the clonic movements which follow the tonic stage of a general epileptic fit are of the same character and depend upon the same motor mechanism as those of a Jacksonian fit which is accompanied neither by a tonic stage nor by an initial loss of consciousness. They exhibit the phasic character of movements associated with cortical activity, and resemble both those which can be evoked by faradic stimulation of the cortex, and those of a Jacksonian fit dependent upon a cortical lesion.

Many years ago, Long Fox, who attributed the tonic spasm of an epileptic fit to cerebral vaso-constriction, ascribed the clonic movements to a "gradual yielding of the vasomotor constriction, allowing at first more blood to enter the arteries than during the period of tonic spasm, but yet far less than is necessary for controlled movement or for rest."

That the cerebral circulation is under direct vasomotor control was long denied, chiefly owing to the work of Leonard Hill, who, believing the variations to be entirely passive, summed up his views in the paradox that "the cerebral vasomotor nerves lie in the splanchnic area." Although the cerebral circulation differs from the circulation elsewhere in many ways, and particularly in its passive dependence upon external circulatory changes, it is now generally admitted to be also subject to active vasomotor control, although the final demonstration of this by direct physiological experiment is still lacking.

Harvey Cushing noted that epinephrin will blanch the pial vessels over the area of its application, and that faradic stimulation will do the same. Brodie

and Ferrier found that on injecting adrenalin into the basilar artery of the removed brain the outflow from the torn sinuses was diminished or completely stopped according to the quantity injected.

During the course of an experiment which Professor Sherrington kindly gave me the opportunity of witnessing, I was struck by the fact that when a faradic stimulus of sufficient strength to evoke epileptiform movements was applied to the cortex, the pia-mater could be seen to blanch, and it naturally occurred to me to wonder whether epileptiform attacks starting from a traumatic lesion may not be accompanied or even initiated by a similar blanching of the cortex.

The evidence in favour of vasomotor activity in the brain is abundant, and it seems incredible that pathological variations in the cerebral circulation should not be associated with definite clinical manifestations. The characteristic rapidity and suddenness of vascular changes, and their characteristic tendency to recurrence, would allow of recurrent phases of disordered cerebral function, and on this hypothesis many of the phenomena of epilepsy can be fully explained.

The cerebral cortex has been raked over and over again, by successive generations of neuro-histologists without yielding up the secret of the cause of idiopathic epilepsy, and it may be that the search, transferred from this barren field to that of the autonomic nervous system, will prove more fruitful.

Before discussing the part played by gross lesions in focal epilepsy, it is necessary to refer briefly to the effects of electrical stimulation of the cortex.

In man the effects of such stimulation appear to resemble closely those obtained from anthropoids, but as the recorded observations are comparatively few, and not primarily experimental, this need not be referred to further, except for one important point. Fedor Krause, in 1911, had the opportunity of stimulating the cortex of a patient who was the subject of Jacksonian epilepsy without gross visible lesion. He found that faradization of the epileptic zone elicited fits, whereas from the rest of the motor cortex only the corresponding movements were obtained, identical currents being used, and the duration of the stimuli being the same in each case.

In this connexion an interesting and probably unique experience recorded by Sherrington is of considerable importance. Having by chance found amongst his laboratory animals a monkey which was the subject of epileptiform attacks, he took the opportunity of investigating the effect of cortical stimulation. The spontaneous attacks had begun in the left angle of the mouth (or perhaps in the tongue), and had spread to the rest of the face, neck, left arm, left leg, and then to the right limbs. Attacks could be induced by the taking of a large morsel of food into the mouth. A minimal faradic stimulus applied to the tongue area of the right hemisphere provoked a tongue movement which almost immediately became clonic and epileptoid, meaning by the latter that it continued as a series of movements after the faradic stimulus of the cortex had been withdrawn. If the stimulus were continued for a few seconds the epileptoid movement spread from the tongue, and would occasionally involve all the facial muscles on the left side, but it never spread beyond the face. In the left hemisphere the tongue area yielded epileptic discharges easily, though not so readily as did the tongue area of the right cortex, nor did the movements spread. Sherrington remarks that it must be remembered that limited epileptiform discharge is usually obtained in the monkey by prolonged or quickly repeated faradic stimulations of almost any point in the motor cortex, and that therefore the result observed with the

tongue area of this animal was of a quantitative rather than a qualitative nature. Further, that the exceptional readiness with which tongue epilepsy could be evoked was remarkable because, in his experience, the tongue area is not one from which epilepsy is usually easily elicited. The results of cortical stimulation in this epileptic monkey fall into line with those obtained by Krause in his epileptic human subject.

We require, however, an explanation of the fact that at least in the highest apes (and probably in man, to judge from Krause's observations) electrical stimulation is incapable of provoking a Jacksonian fit of any magnitude. Even in Sherrington's epileptic monkey, "by no persistence of the faradization could the epileptoid movement be made to extend beyond the face. It never, unlike the natural seizures observed in the animal, spread to the neck or limbs even of the same side, let alone the opposite." We know that in experimental work the depth of the narcosis affects the results in a marked degree, and it is possible that it is an important factor in determining the differences noted. It may be, too, that higher control, whether consciously exerted or not, accounts for differences in the extent to which the cortex responds to the stimulus of a focal lesion. It is a matter of common observation that patients can often arrest the spread of clonic spasms by holding the affected limb firmly at the commencement of a fit; by this manoeuvre controlling influences are doubtless directed to the cortex involved, so as to neutralize the effect of the abnormal stimulation.

Horsley and Schäfer many years ago demonstrated the fact that the excitability of the cortex is increased by repeated stimulation, so that a weaker current will evoke a spread. This was confirmed and amplified by Leyton and Sherrington, who, in the course of their work upon the cerebral cortex, elicited many additional facts bearing upon focal epilepsy. Great variations were observed among individual animals in the ease with which a Jacksonian "march" could be provoked by the faradization of a cortical motor point. Not only is the threshold of excitability lowered by faradization, but the area from which a given movement can be obtained may be gradually extended. Thus after provoking movements of the lips, for example, by stimulating a cortical point just in front of the central sulcus, the same movement may be elicited by faradization of a previously inexcitable point more anteriorly situated. Further, faradization of the post-central cortex may facilitate the elicitation of movement from certain points in the precentral cortex at about the same horizontal level.

In this connexion the following experience is of interest. Working with Dr. Gordon Holmes I had the opportunity of observing the effect of faradic stimulation of the cortex in a patient who for several years had been the subject of frequent focal fits resulting from a traumatic lesion. This lesion involved an area of the cortex, some 4 cm. in diameter, both behind and in front of the Rolandic sulcus, at about the level of the temporal crest. The stimulation was carried out in order if possible to identify the point of origin of the fits, and the technique employed was the same as that used by Sherrington. For obvious reasons the observations could not be made with the completeness of a physiological experiment, but there was no doubt as to the readiness with which epileptoid movements could be evoked from many points, some of which were far distant from the cortical area of normal representation.

Leyton and Sherrington have named the movements obtained by electrical excitation of the cortex "functional" movements, and remark that they are in themselves co-ordinate and seem to form parts of complex purposive acts.

Electrical stimulation of the cortex, even when carried out with every possible refinement of technique, must be the grossest caricature of the natural stimuli which provoke purposive movements. Yet such electrical stimuli applied to the precentral cortex in man can be made to evoke definite movements, limited in extent and bearing a striking resemblance to simple natural movements. Although, as Ferrier first pointed out, these movements exhibit purposive co-ordination, they are not purposive movements, and in this respect resemble those of mild epileptiform attacks.

A Jacksonian fit is merely a series of fractional movements, devoid of purpose, and determined in point of sequence only by the relative anatomical position of the cortical areas in which they are represented. In other words, a Jacksonian fit is made up of a series of fractional acts, which, although in themselves co-ordinate, lack the mutual co-ordination of natural purposive acts. This mutual inco-ordination of fractional acts is illustrated by the biting of the tongue, due to the unnatural sequence of tongue protrusion and jaw closure. In this respect the movements of epilepsy resemble the effects provoked by electrical stimulation, which, even when so applied as to evoke a "march" or sequence of movements, does not appear ever to call into action the peculiar synthesizing function of the cortex defined by Sherrington. No series of fractional movements so combined as to bring about a recognizable purposive act, even of a simple character, has, so far as I am able to ascertain, been recorded as resulting from electrical stimulation of any part of the cortex. In fact no more intelligent movements can be obtained from the cortex than from the mid-brain; they differ in character rather than in purpose, the one set taking the rhythmical form characteristic of movements obtained from the cortex, and the other lacking that particular nature. It seems to be not impossible therefore that the disturbance of cortical function, whether caused by experimental stimulation or by a gross pathological lesion, may, in part at least, be due to a lowering of the normal inhibition, and that the movements which result may be of the nature of release phenomena. On such a conception the epilepsy resulting from pathological lesions can be brought into line with that which can be induced experimentally.

The association between gunshot injuries of the brain and the development of fits is so obviously a case of cause and effect that I will refer to them before touching on the subject of fits associated with morbid lesions, and on those of idiopathic epilepsy.

The local morbid conditions underlying the fits which result from gunshot wounds of the head fall into three main groups:—

(1) Recent lesions such as local contusion associated with small hæmorrhages and œdema; or the more gross disruptive effects of a penetrating wound.

(2) Inflammatory lesions due to recrudescence of sepsis, where a latent infection becomes active and gives rise to an area of softening, or to an actual abscess.

(3) Cicatrices binding the scalp to the brain and membranes through a cranial defect.

As regards the first two groups, the early fits, namely those which occur in the first few days after the injury, as well as those connected with recrudescence of sepsis, are clearly associated with vascular disturbances due to direct damage to blood-vessels, thrombosis, inflammation and œdema; they continue only during the period of acute circulatory disorder, and cease when that period comes to an end.

The third group, with cicatrices binding the scalp to the damaged brain, is

by far the most important, and it is to the cases included in this category that I wish to draw particular attention.

A year ago the Re-survey Boards of the Ministry of Pensions had, in the previous twelve months, examined more than 25,000 old cases of gunshot wound of the head. Excluding those examined more than once during that period, the number of individuals was approximately 18,000, amongst whom nearly 800 (or $4\frac{1}{2}$ per cent.) were the subjects of epileptic fits. A very large number of such patients present a cranial defect through which the scalp adheres to the membranes and the damaged brain. Penetration of the dura at the time of the wound entailed not only gross direct damage to the underlying brain and its vessels, but also invasion of the injured tissues by micro-organisms. The consequent inflammation resulted in further destruction of nerve tissue as well as a greater disturbance of the vascular supply, both from thrombosis at the time and from strangulation of vessels later by fibrous tissue, the amount of which would be to a large extent proportional to the intensity and duration of the preceding inflammation. Further, the penetrating wound is inevitably followed by adhesions between the surface of the brain and the scalp.

It may reasonably be assumed that the rich blood supply of the normal cortex provides a wide margin of safety against accidental variations, whilst the relatively avascular scarred cortex possesses a smaller margin of nutritional safety. In these circumstances local circulatory disturbances would be likely to arise from accidental causes. One such cause which I believe to be of the very greatest importance, depends upon the fixation of the brain at the point of damage to the overlying membranes and scalp, and is occasioned by the cerebral movements.

There is no doubt that the normal brain obeys the law of gravity and alters its position with varying positions of the head. Every organ of the body possesses a degree of mobility proportional to the extent to which it is covered by a serous membrane separating it from the wall of the cavity which contains it. The serous membranes of the thoracic and abdominal cavities, as well as those which line the joints and the tendon sheaths, result from and facilitate movement. The brain is no exception; the serous cavity lying between the dura and the arachnoid can fulfil no other purpose; the intense pain occasioned by any movement of the head in meningitis is analogous to that of pleurisy. Whenever the skull and dura are widely opened during an operation, movements of the brain can be demonstrated by altering the position of the head, and although their extent is probably exaggerated by reason of the different physical conditions which obtain in the open as compared with the closed skull, there is no reason to suppose that all movement is absent when the skull is whole. Indeed J. Luys has demonstrated the fact of cerebral mobility by means of frozen sections, and by means of a specially designed cerebral kinesiometer Gavoy has been able to measure excursions of from three to nine millimetres.

When a brain, attached to the scalp by adhesions, attempts to move in response to a change of posture, it is prevented from doing so from a pull at the point of anchorage; this pull either mechanically or, possibly, by causing a reflex vasoconstriction, may well produce a momentary local anæmia in the damaged brain, and so initiate a fit.

Seeing, however, that only a very small number of patients with anchored brain develop epilepsy, it is obvious that the local lesion is but one of the links in the ætiological chain. Clearly a given stimulus is not effective for all

brains, and it is necessary to assume in those patients who do develop fits a tendency to epilepsy resulting from what is vaguely called a relatively low degree of stability of the nervous tissue.

I have been fortunate enough to encounter a case which illustrates this important point remarkably well:—

A man, aged 35, had at the age of 15 been accidentally wounded in the forehead by a revolver bullet. He was operated upon shortly after the accident, and was in hospital about fifteen weeks. He afterwards remained perfectly well in every way, joined the Motor Transport Service in 1915, and was sent to France where he served until 1919. He received no wound or other injury, but was often under shell fire and bombing. His first fit occurred after six months' service, and between that time and the date of his admission to hospital in 1920 he had about two dozen fits, all of which occurred during sleep, except two. The fits associated with frontal injuries of this character not infrequently occur during sleep, and they are, if the explanation which I have suggested is correct, to be attributed to the sudden changes of posture which may occur during sleep. This patient, in the two attacks which occurred in the daytime, fell unconscious, without warning, and remained so for some minutes. He did not bite the tongue nor urinate; he suffered neither from headaches nor giddiness. There was a small irregular circular opening in the right frontal bone, into which the brain bulged on stooping forward. No abnormal neurological signs were detected.

The interpretation of this case seems to be that, although for twenty years this man had had a cranial defect through which the brain was anchored to the scalp, the local lesion had been insufficient to cause a fit until the nervous stability had been lowered by the stress of warfare. In May, 1920, an operation was performed. The scalp was dissected free from the dura, and the dura was separated from the bone for an inch or more beyond the edge of the opening. A thin sheet of celluloid was placed over the dura, extending some distance between it and the inner surface of the skull. A thicker sheet of celluloid was used to close the bony opening. Some ten weeks later he had a fit, whilst asleep, and since then no further fit has occurred.

In cases of this class the aim of an operation is twofold, first to ensure a permanent separation of the brain from the surface at the point of damage, so as to restore as far as possible its mobility; and secondly to close the bony opening so as to restore the physical conditions under which the cerebral circulation normally works. Both of these objects can be attained by the use of celluloid, the technique of which procedure will I hope form the subject of a future communication.

I and my assistants at the Tooting Pensions Hospital have now operated upon more than 200 cases by this method. About 120 of these patients suffered from fits. The time has not yet arrived for passing a judgment upon the results, but I may say that so far they are remarkably promising, even in some cases in which the fits had occurred over a long period. Nor is it possible to estimate fairly the extent to which the beneficial results are due to the other treatment carried out at the same time, for in all cases the patients have been kept in hospital for from two to six months after the operation, and treated regularly with small doses of bromide.

It seems probable, to judge from our experience, that better results may be expected in cases in which the fits have been infrequent, and have not occurred over a long period of time. Nevertheless, satisfactory results are not impossible even in long-standing cases, as shown by the following example:—

A man aged 21 had, when 7 years of age, received a severe cranio-cerebral injury in the left parietal region, which resulted in gross hemiparesis. A large area of bone had

been removed, and the damaged brain had become adherent to the scalp. The brain pulled upon the scalp, which became concave when the patient lay upon his right side; the brain bulged when the head was inclined to the left. Eleven years after the accident he began to suffer from fits, the origin of which was attributed to a blow upon the head in the region of the cranial defect. When admitted to St. Thomas's Hospital he had had fits for three years, for the first year about once a fortnight, for the second year about three times a week, and for the third year about once a month. On one occasion he had twenty-five fits in a single day. He was operated upon by the celluloid method and carefully treated for several months afterwards. Two years have now elapsed since the operation, during which time he has had only two fits. He has taken no drugs for a year, has improved greatly in general health, and is able to do some light work.

The claim of surgery to participate in the treatment of fits resulting from injuries to the skull and brain may fairly be regarded as well established, not only on the ground that a reasonable explanation exists of the mechanism by which they are evoked, but also because we now possess a good deal of evidence to show that the fits can in many cases be either abolished, or very considerably reduced in number and severity, by an operation which succeeds in removing or at least modifying the local exciting cause. This evidence, now in course of preparation, I purpose bringing forward in the near future.

Leaving now the subject of epileptiform attacks due to gross injuries, we must approach the question as to what contribution surgery has to offer towards the treatment of fits other than those of traumatic origin, whether associated or not with local lesions of the brain. For the purpose of examining this question, I would divide these cases into three groups:—

The first group comprises all the cases in which there exists a lesion both lending itself to accurate localization and allowing of a reasonable surmise as to its nature. Many tumours, both innocent and malignant, as well as abscesses, cysts, tuberculomata and gummata, can be included in this category. Whilst any of these lesions may constitute the starting point of an epileptic attack, it must not be forgotten that there is no gross lesion, whether traumatic or otherwise, which necessarily causes fits. On the contrary, the proportion of patients with any such lesion who develop fits is small. As already mentioned, the incidence of epilepsy amongst pensioners with old gunshot wounds of the brain does not at the present time reach 5 per cent.

The frequency, however, with which fits are associated with tumour of the brain is perhaps somewhat striking. I have recently looked through the notes of 270 cases of brain tumour, exclusive of cerebellar and pituitary cases, upon which I have operated. I find that no fewer than eighty-two patients, or 30 per cent., exhibited fits of a focal character. Grouping regionally the tumours associated with fits, I find that exactly half were situated pre-centrally, and of the remaining 41, 22 were post-central, 12 temporal and 7 occipital. Of the whole 82 tumours, 65 were malignant and 17 were endotheliomata.

In no fewer than 40 per cent. the fit was the first symptom of which the patient complained. The fit was the first symptom in a rather larger proportion of the endotheliomata than of the gliomata, but the difference is not, in my opinion, sufficiently striking to be of any great value in diagnosis.

There can be no doubt, I think, that the nearer the tumour, or the surrounding area of cerebral softening, approaches the central sulcus, the more likely are fits to occur.

The exact nature of the stimulus by which a tumour or other gross lesion elicits evidence of cortical disturbance, whether of a motor or of a sensory

character, is not easy to define. To say that a lesion "irritates" the brain merely creates fresh difficulties by raising the question of the exact meaning of irritation. Used in its usual sense irritation implies activity, but a lesion such as a bony boss resulting from a depressed fracture cannot be regarded as an active agent. If the brain from time to time accidentally, or continually on account of its respiratory and cardiac movements, impinges upon such a bony boss, changes conducive to epilepsy might occur. A tumour might be in a sense "active" from alterations in size or tension due to variations in its blood content, or to such sudden gross change as that caused by a hæmorrhage into it. Active inflammatory changes also occur from time to time in the membranes bounding a cortical tumour, whilst, naturally, vascular disturbances are a prominent feature where frankly inflammatory lesions are concerned. In the immediate neighbourhood of many of these lesions the appearances are such as to suggest that rapid or sudden alterations of vascularity could readily take place, and such changes seem to me to constitute the one common factor which is capable of explaining the associated epileptiform movements, and so of bringing their causation into line with that of other forms of epilepsy, whether traumatic or apparently spontaneous.

In the surgical treatment of the cases included in this first category, namely of recognizable and localizable gross lesions, the operation is naturally directed primarily to dealing with the tumour or other lesion, and the result as regards the fits, as well as other symptoms, will depend upon its nature and the completeness with which it can be removed. When a simple tumour can be completely removed, or an abscess shelled out entire with its capsule, the outlook is good. When an abscess has to be drained, fits are not so likely to be abolished, since the drainage necessitates anchorage of the brain to the surface, which is in itself, as I have endeavoured to show, provocative of epilepsy.

The second group comprises those cases in which fits of a definitely focal character occur, but in which the nature of the lesion, if any, cannot be ascertained without actual inspection of the brain. Operation, which is fully justified in many of these cases, must necessarily be primarily of an exploratory character. In spite of the fact, however, that the technique of cranial operations has been so greatly improved, we must not fall into the error of putting a cerebral exploration quite on a level with an abdominal exploration, or undertake it with the same confidence that, even if nothing is found, no harm will result. By such exploratory operations I have found tumours, meningeal cysts, on one occasion a nævoid angioma, and on another occasion a small abscess, all of which were capable of being satisfactorily dealt with.

On the other hand, a wide exposure of the cortex may reveal no visible lesion of any kind; the brain may appear to be absolutely normal both to inspection and palpation. In such a case the question naturally arises as to whether that portion of the cortex in which the initial movement is represented, having been defined by electrical excitation, may be excised. The effects of cortical excision upon function are well known, thanks to Horsley, Sherrington, Marinesco and others, but the results of such excisions in patients suffering from focal fits without visible lesion have not proved very encouraging, even in the hands of the most expert operators.

Judging from an experience of some fifteen cases, Cushing writes as follows: "Some had unexpectedly resulted in cures; one or two which promised to be especially favourable owing to the circumscribed nature of the initial movement (thumb and corner of mouth) were not benefited."

Krause gives details of three cases of focal epilepsy without visible lesion in which he excised what he calls the "primary spasming centre." One patient had had no fit some months later; one eight years later only had occasional twitchings; and one died, shortly after the operation, in status epilepticus.

Krause attributes the failure of cortical excisions in the hands of others to the localization having been made on anatomical grounds and not by electrical excitation. He believed the resultant scars to be of no importance and not provocative of any spasm or symptoms whatever.

It is clear that in determining the advisability of performing cortical excision the resultant disabilities would be of less account in dealing with focal epilepsy starting in parts already deprived of their function. The published cases are too few and too insufficiently recorded to afford good ground for any definite conclusions. But the subject cannot be altogether dismissed without further investigation.

The third group, namely that of the so-called idiopathic epilepsies, includes all the cases in which the fits cannot be ascribed to any ascertainable organic lesion, and do not possess any features pointing to a definite focal origin. I have searched in vain amongst the many records of operations for epilepsy, some purely fantastic, some based upon a more or less reasonable conception of its causation, for any encouragement to pursue further the quest for an operative procedure which holds out any prospect of benefiting the sufferer from idiopathic epilepsy. It may be unwise to say that the future will reveal nothing fresh in this direction, but it is at any rate certain that, at the present time, surgery has nothing to offer in the treatment of general idiopathic epilepsy.

In some other forms of epilepsy, as I have indicated, surgery may be made to play a useful part, but no operation can alone be expected to effect a cure. I am, however, convinced that, in properly selected cases, surgical treatment can be of great value in lessening the task demanded of medicinal and other therapeutic measures. If these measures cannot be carried out rigorously over a prolonged period, then, for the good of the patient and the credit of surgery, it were better to refrain from operating.

Cynical friends have told me that operations upon the nervous system do but illustrate the truth that hope ever triumphs over experience. The surgeon must be an optimist, but his optimism need not be that of the ostrich. It should be based upon the expectation that inquiry into the causation of those diseases which he seeks to remedy will eventually furnish the clue to their successful treatment. The search may lead him into deep waters, and this must be my excuse for venturing so far out of my depth as to address a gathering of neurologists on such a subject as epilepsy.

Section of Neurology.

President—Mr. PERCY SARGENT, C.M.G., D.S.O., F.R.C.S.

Persistent Pain in Lesions of the Peripheral and Central Nervous System.

By WILFRED HARRIS, M.D., F.R.C.P.

PERSISTENT pain, which may be defined as acute bodily discomfort, varying in degree from a sensation of soreness or aching to one of intense and intolerable agony of torment, may be due to a variety of diseases affecting primarily other structures and tissues than the nervous system. Thus, carcinoma, or other malignant growth, naturally occurs to us as a probable cause of any deep-seated pain, persistent in character and lasting for weeks and months, more especially if accompanied by progressive emaciation.

The appreciation of any sensation of pain due to visceral or bone disease necessarily involves the agency of the nervous system in the transference of the sensory impulses from periphery to thalamus and cerebral cortex; but I am limiting my remarks as far as possible to diseases involving the nervous system itself, and shall omit discussion of the referred pains of visceral disease, such as dental neuralgias, errors of refraction, angina, the colics, sinus suppuration, abscesses, acute inflammations and the like.

For the sake of convenience I have in the following classification arranged the causes of persistent pain in diseases of the nervous system in five classes, progressing from periphery to centre, or from nerve-ending to cerebral cortex.

PERSISTENT PAIN IN LESIONS OF THE PERIPHERAL AND CENTRAL NERVOUS SYSTEM.

(1) *Peripheral, due to inclusion of nerve-endings in scar.*

- (a) e.g., Neuro-fibrositis, traumatic or rheumatic; adiposis dolorosa.
- (b) Due to septic or to rheumatic terminal trigeminal neuritis :—
 - (i) Chronic paroxysmal trigeminal neuralgia (Fothergill's disease, tic douloureux).
 - (ii) Chronic neuralgia of upper or lower jaw.
- (c) Geniculate neuralgia.
- (d) Glossopharyngeal neuralgia.

(2) *Disease involving nerve trunks.*

- (a) Supraorbital neuralgia.
- (b) Multiple neuritis.
- (c) Brachial or sciatic perineuritis.
- (d) Tumours or gummatous neuritis :—
 - (i) Trigeminal.
 - (ii) Spinal, e.g., neurofibromatosis.
- (e) Causalgia.
- (f) Cervical or first rib pressure.

(3) *Lesions of posterior root ganglia or posterior roots.*

- (a) Post-herpetic neuralgia :—
 - (i) Trigeminal.
 - (ii) Spinal.
- (b) Tabetic neuralgia.
- (c) Other root scleroses.

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(4) *Central sclerosis of fillet or thalamus.*

Intra-medullary growths.

Syringomyelia and syringobulbia.

(5) *Psychalgias.*

Neurofibrositis.—The pains of chronic or acute fibrositis of the lumbar or dorsal region, often described as lumbago and muscular rheumatism, are doubtless only too well known to many of us, though common as the affection is, its pathology is largely a matter of conjecture. Violent or (and especially) sudden muscular action is the exciting cause in a considerable number of cases: the sudden onset of intense pain immediately after a heavy muscular strain, such as a slip or fall when carrying a heavy weight, the pain relieved by lying down or sitting in a deep chair, and aggravated immediately on movement, suggest rupture of muscle or tendinous fibres involving sensory nerve filaments, as the cause. In the majority the pain disappears after a few days or weeks, while occasionally the disorder persists for years.

Recently I was consulted by a farmer, a powerfully built muscular man, who some ten years ago slipped and fell when carrying a sack of wheat weighing about 260 lb. He was immediately seized with acute pain across the lumbar region, and more especially in the neighbourhood of the right posterior iliac spine. He has been subject to this pain ever since off and on, worse on movement or during heavy lifting, and now and again he is subject to exacerbations so severe he can scarcely move or dress himself. When I saw him during such an attack, his spine was flexed laterally towards the right, and there was a small circumscribed area of great tenderness on deep pressure over the right posterior iliac spine.

Careful marking of the site of chief tenderness, followed by injection of a few minims of 90 per cent. alcohol deep into the tender area, completely relieved his pain within fifteen or twenty seconds, so that he was able to stand up straight, the lateral flexion of the spine having now disappeared, and he walked away in comfort.

Acupuncture has long been recommended since Sydney Ringer's time for similar conditions, but if one or more definite areas of tenderness on deep pressure are discovered, I consider that alcohol puncture is far more valuable.

Traumatic neuro-fibrositis may involve larger nerve trunks, not nerve filaments only, and sciatic perineuritis is a fairly common early sequel to fibrositis of the lumbar region, whether this is of rheumatic origin or due to a fall or other injury. Here, again, the pain may continue for months or even years.

Sciatic perineuritis as a sequel of muscle strain or fall is particularly amenable to treatment by massive saline injections into the nerve just below the notch, the probable site of the nerve sheath damage. Alcohol injection of the sciatic must, of course, never be attempted, owing to the certain result of paralysis of the foot which would ensue, but saline injection of 50 or 60 c.c. preceded by 2 c.c. of 2 per cent. novocain into the nerve often cures the sciatica immediately. This treatment, though often valuable, is less certainly successful in the rheumatic sciaticas, possibly owing to the large area of the nerve which may be the seat of trouble. In both the rheumatic and the traumatic sciaticas there are frequently spots of deep tenderness with aching pain either in the neighbourhood of the trochanter or between the notch and iliac crest, which may keep up the discomfort and pain after the actual sciatica has been relieved. These are probably local areas of neurofibrositis in the glutei or erector spinæ, and may be mostly successfully injected deeply with alcohol, after the nerve itself has been treated with the saline injections. Probably the saline injections relieve by breaking apart laterally adhesions of the nerve sheath, as the sciatic nerve is a loosely built nerve and readily takes the fluid, swelling up like an egg at the site of injection (as may be seen by injecting the nerve after exposing it on the post-mortem table).

I have never seen paralysis of the sciatic as a result of violent muscular action, but in the region of the brachial plexus, local paralysis from involvement of the posterior thoracic, long thoracic, or circumflex nerves may occur. As with sciatica, so *brachial perineuritis* may occur from muscular overstrain, or rheumatism and other toxic causes, such as pyorrhœa. Usually the posterior cord and musculo-spiral nerve suffer most. As in the lumbar region, so also in the neighbourhood of the scapula and sometimes in the forearm, areas of deep tenderness may be the sole cause of chronic wearing pain, or may accompany a more extensive brachial neuritis.

Alcohol puncture of such tender spots often has most brilliant results, chronic pain that may have persisted for many months or years being relieved instantaneously. The spots must be carefully located* and marked, and a fine needle—hypodermic size is usually long enough—plunged vertically into the spot down to the level of the rib or scapula. Care must of course be taken that the needle does not pass between the ribs and pierce the pleura.

Bruising of the scalp by an injury to the vertex from a blow against the lintel of a door, or fall of a heavy weight, is sometimes followed by persistent headache, varying in intensity, or periodic, and associated with a local area of tenderness on pressure. These cases also may be relieved by the same treatment. This form of headache must be distinguished from migrainous neuralgia, in which the periodic headache is unilateral and often associated with intense pain and tenderness on pressure on one temple. Alcohol injection in these cases is quite useless, as is only to be expected, the origin of the pain being probably central and not peripheral.

Chronic paroxysmal trigeminal neuralgia is certainly of peripheral origin, and is probably due to septic neuritis of nerve filaments in the maxilla or mandible. Scarcely ever does this disease affect the upper division and supra-orbital alone, but it may be involved along with the second division.

John Fothergill's original description nearly one hundred and fifty years ago of the painful attacks is scarcely to be improved upon to-day, though his view of its pathology, that the origin must be cancerous, because of the long-standing pain, is now discarded. Many causes appear to contribute to its appearance. Heredity of the disease I have met with in about 1 per cent. of my cases. Strong emotion may precipitate an attack. Injury and blows on the jaw are a not unfrequent cause, as may also be exposure to severe chill, as in motoring or driving; a septic antrum has preceded typical tic douloureux of the second division too often to be a coincidence. I find the disease twice as frequent in women as in men, a point also noted by Fothergill, though he saw only sixteen cases in his practice. A curious point shown by my statistics is that the disease is twice as frequent on the right side as on the left, and commoner in the upper than the lower jaw, though both are often affected. The larger incidence on the right side may be due to better use of the toothbrush on the left side of the mouth, as would be natural in right-handed people, according to Mr. Warwick James. Bilateral trigeminal neuralgia is comparatively rare. I have met with it perhaps thirty times only among several hundreds of cases. The disease rarely disappears spontaneously when established. I have known this occur only once, in the father of a sufferer from this disease, who was my patient. Her father suffered for twenty-five years until he was aged 90, but was free for the last fifteen years of his life, living to 105. In the early stages, however, long periods of remission may occur; I have known thirty years elapse between the first and second attacks, and intervals of one to two years are common. Sometimes a certain periodicity is seen, as for a few weeks to three months every autumn or winter. As the years pass, usually the intervals of freedom get shorter. In a few, there is practically no remission, agonizing pain inevitably following every movement of the face, as in eating or in washing. One of my patients, a lady, had been unable to wash the right side of her face for twenty years. Often the lightest touch of a hair or draught of air will start a paroxysm, though at other times nothing may provoke the pain. During the painful bouts the prick of a pin usually seems more acute on the affected side, though this is a temporary hyperæsthesia only, and is not present between the attacks.

Fothergill, 150 years ago, thought hemlock pushed to toxic doses was a cure for this complaint, but our experience nowadays is that drugs are comparatively rarely of service, and that real relief is obtained only by a solution of continuity of the offending nerve trunk. Practically the choice, in severe cases of pain, is between gasserectomy, or division of its sensory root—both severe operations—on the one hand, and alcohol injection of the nerve trunks at their deep foramina, or injection of the ganglion itself on the other. For bilateral cases of this neuralgia the gasserectomy operation is not permissible, owing to the jaw drop that would ensue, though bilateral destruction of the ganglion by injection may be done, as the motor root then recovers, though the sensory ganglion cells are permanently destroyed. A curious point I have often noticed when injecting the foramen ovale and ganglion is that the ophthalmic or inner portion of the ganglion becomes totally anæsthetic before the second division, and it may be extremely difficult at times to get total anæsthesia of the cheek when the forehead and eyeball remain perfectly anæsthetic. I have no satisfactory reason to account for this.

Another puzzle that occasionally, though fortunately rarely, arises, is the partial recurrence of sensation on the chin and remainder of the third division, when the first and second divisions remain totally anæsthetic. With this reappearance of sensibility, pain may return, and that this is not necessarily the result of the faulty injection is proved by the fact that gasserectomy and division of the sensory root behind the ganglion may not alter the conditions. One is therefore tempted to call the persistent pain a psychalgia, but of this I am not convinced, as there is no doubt true sensation on the lower lip and chin. Gasserectomies, of course, like other operations, may sometimes fail through being incomplete; I have seen several such cases in which pain has returned after about ten years, with reappearance of cutaneous sensibility, yet I do not think that is the explanation in the few cases above referred to, though no such case that I am aware of has come to autopsy.

Another form of *persistent trigeminal pain*, of which I have seen many instances, is in my experience peculiar to young women. It is continuous, not paroxysmal, though it may vary in severity, and it affects either the upper or the lower jaw. It is not provoked by eating, laughing, washing or other movements of the face as in the case of true tic douloureux. It is more difficult to relieve by alcohol injection than spasmodic tic douloureux, as total anæsthesia is necessary to abolish the pain, and with commencing regeneration of the nerve the pain recurs. In tic douloureux, however, in a large majority of cases, a medium anæsthesia from injection may be sufficient to abolish the pain, in some cases for many years; in one of my early cases there has been no recurrence 12½ years after injection of the foramen ovale, though only light anæsthesia now remains.

This lady had previously suffered from typical tic for twenty years, section of the inferior dental nerve having given only two years' relief. In her case the neuralgia commenced at 17, and I have seen it commence at 17 in two other cases and once at 16, many in the twenties, but most commonly about the age of 50. On the other hand the type of persistent neuralgia of upper or lower jaw previously described I have met with only in women of 15 to 35. I am very uncertain about its cause, unless it be a chronic osteitis of the jaw. Its limitation to women I do not understand, as the sufferers I have met with have not been notably of the neurotic type. Moreover, the true tic douloureux is undoubtedly much more frequent in women than in men, about two to one. These cases are more difficult to treat than true trigeminal neuralgia, as nothing short of total nerve destruction cures the pain.

Supra-orbital Neuralgia.—Persistently recurrent supra-orbital neuralgia is met with in both sexes, though oftener in women. I assume that migrainous and true trigeminal neuralgia, and the peripheral causes such as errors of refraction, frontal sinusitis, frontal herpes, antral abscess and dental neuralgias have been excluded. Sometimes paroxysmal supra-orbital neuralgia occurs daily, coming on about the same time, perhaps 10 or 11 a.m., and lasting until

5 p.m. I have seen this type follow influenza several times. Usually the pain is limited to the supra-orbital nerve, but it may involve the whole of the ophthalmic branch.

In a recent case, a woman of 47, pain began four years ago, lasting for eight hours daily from January to June. Next year and the year after a similar repetition occurred. A year ago she had a more severe attack and since then has had pain daily from 12 noon to 5 p.m., never a day free. The pain is situated in the forehead and left side of head as far back as the coronal suture, and extends along the left side of the ridge of the nose. Unlike trigeminal neuralgia the pain is not evoked by talking, eating, or other movements of the face, or by rubbing. Supra-orbital injection gave little or no relief, though deep anaesthesia was produced. Injection of the Gasserian ganglion was then done, the anaesthesia of the first division being total for an hour or more, but subsequently it wore off partially. The neuralgia disappeared completely for several days, and then reappeared in a much attenuated form. Very probably total destruction of the ganglion would have produced a complete cure of the neuralgia.

Perhaps the majority of paroxysmal supra-orbital neuralgias are migrainous in type; for such cases alcohol injection is of little or no use. In some subjects this migrainous periodic neuralgia is limited to the temple.

Only comparatively rarely does true trigeminal neuralgia invade the first division of the fifth nerve, that is to say a paroxysmal neuralgia, sudden and intense, and brought on by movements of the face, rubbing of the skin, or even a draught. In only one instance have I seen it remain limited to the first division of the fifth for years without either the second or third division becoming involved, and even in this case rubbing the chin would start the pain in the forehead. Practically always the neuralgia also involves the second or even all three divisions when the supra-orbital distribution is involved, though it is to be remembered that the pain in the second division of the fifth frequently, indeed generally, extends above the eyebrow and in front of the temple.

In all cases of persistent or recurrent pain, anaesthesia must be looked for. If it is present in trigeminal cases then either syphilitic neuritis, gumma or tumour is the cause.

Geniculate Neuralgia, or neuralgia affecting the distribution of the sensory fibres contained in the seventh nerve, has been fully described by Ramsay Hunt and others, though some deny the association of the seventh nerve with such neuralgias.

Transient pain around and behind the ear, lasting for two or three days, is a commonplace in association with the onset of facial palsy, and often precedes the motor paresis. Much rarer are instances of true herpes zoster affecting the auricle in association with facial palsy. The distribution of the herpetic rash is usually on the concha and antihelix, though it may be found behind the ear where the pinna joins the scalp, and also along the posterior wall or the exterior auditory meatus. Such a distribution of herpes I saw once in a medical man, without facial palsy, who for many weeks afterwards had excruciating paroxysmal neuralgia affecting the ear, front of the ear, and back of the lower jaw and neck. Pierce Clark and Taylor, of America, describe a case of chronic tic douloureux affecting this area which was cured by the operation of trephining and dividing the pars intermedia Wrisbergi, or sensory root of the seventh nerve, intracranially.

Glosso-pharyngeal Neuralgia.—A rare form of chronic paroxysmal neuralgia or tic douloureux may affect the glosso-pharyngeal nerve. In its paroxysmal suddenness of onset, and in the severity of pain, glosso-pharyngeal tic is identical with trigeminal tic, for which it may easily be mistaken. Distinguishing it, however, from the latter, the pain in glosso-pharyngeal tic starts in the throat, in the region of the tonsil and anterior pillar of the fauces. The pain radiates to the ear, and especially just in front of the ear, along the back of the mandible, and into the upper part of the neck.

I have met with two only of these cases, both of which had lasted over ten years, one in a man aged 40, the other in an old lady of 87. As in trigeminal tic, the first

onset of the pain may be furious and sudden; in the man's case the pain attacked him in the throat as he opened his mouth to eat a sandwich. When I met with these cases, now ten years ago, I knew of no reference to glosso-pharyngeal neuralgia, and in case the pain might be an unusual form of trigeminal neuralgia, I injected the third division at the foramen ovale in each case, quite successfully as regards destroying this branch, but without influencing the recurrent neuralgia. I have since seen somewhat similar spasmodic pain, with intense hyperæsthesia of the side of the neck, in a case of recurrent epithelioma in the tonsil, following seven years after extirpation of a vocal cord for malignant growth. It was this case which convinced me of the identity of the glosso-pharyngeal tic in the two previous cases referred to, and I have lately seen a description by Sicard in France of three cases, met with during the war, of glosso-pharyngeal neuralgia, which were cured by surgical help by division of the nerve of the neck.

DISEASES AFFECTING NERVE TRUNKS.

Chronic pain in the distribution of the trigeminal nerve may be due to tumours or gummata involving the sensory root of the fifth nerve within the skull or one or more of its branches externally. Tumours in the ponto-cerebellar angle may irritate the sensory root of the fifth, and simulate trigeminal neuralgia for years. The pain however, though variable, is less spasmodic, and is not brought on by light touches or movements of the face. The main point in distinguishing lesions of the trunk or main branches from trigeminal neuralgia is the appearance of diminished sensibility in the affected area. Motor palsy of the muscles of mastication also may be present.

When these signs of gross damage to the fifth nerve are found, trigeminal neuralgia may confidently be excluded unless neurectomy or alcohol injection has previously been done. Peculiarly distressing cases to deal with are the naso-pharyngeal growths causing persistent pain and increasing anaesthesia of either the second or third divisions of the fifth. When the growth invades the zygomatic fossa and involves the third division, deafness of that ear is usually produced by involvement of the Eustachian tube. When the growth is more central and invades the sphenomaxillary fossa, besides involving the second division of the fifth, this is followed first by diplopia and later by proptosis and fixation of the eyeball through extension into the back of the orbit. Beyond anodyne remedies I know of nothing that relieves these cases. Operation seems useless; the growth is never circumscribed and always recurs. In malignant growths of the maxilla pain may be exceedingly troublesome, even after excision, when recurrence takes place. This pain may be completely relieved by a successful alcohol injection of the Gasserian ganglion. Similarly the agonizing pain due to carcinoma of the side of the tongue and lower jaw may be completely arrested by alcohol injection of the third division of the fifth nerve at the foramen ovale.

Persistent trigeminal pain for weeks and months, non-spasmodic, and accompanied by diminished sensibility of that side of the face, but without the pressure signs above mentioned of Eustachian deafness, proptosis, and diplopia, should suggest gumma as a probable cause. Even if the Wassermann reaction be negative, it is well always to give anti-syphilitic treatment a trial. I have met with several such cases of syphilitic trigeminal neuritis which cleared up completely under treatment by biniodide of mercury or salvarsan injections.

RIB PRESSURE ON BRACHIAL PLEXUS.

Chronic pain in the arm and neck, running down to the inside of the hand, in women between 20 and 30, will usually suggest cervical rib as a cause, through pressure on the first dorsal nerve as it rises to join the inner cord. Wasting of the musculature in the hand and diminished sensibility along the inner border of the forearm to the wrist render the diagnosis more certain. If a skiagram demonstrates a cervical rib, the position is clear.

Many cases of rib pressure due to the first rib alone, in the absence of a cervical rib, have been recorded; I have had two such cases successfully relieved by operation within

the last six months. In one of them the first rib caused a prominent hard swelling above the clavicle which it was difficult to believe was not a cervical rib until the skiagram proved the contrary. The diagnosis is therefore more complicated and difficult now that we must realize that with symptoms suggestive of cervical rib the skiagram may be normal.

CAUSALGIA.

During the war the frequency of cases of persistent agonizing pain due to injuries of nerves, often slight, was most remarkable. The large majority of these cases involved the median or internal popliteal nerves; though I have seen it also in the distribution of the ulnar, long saphenous, external cutaneous of the thigh and radial nerves.

In some cases the nerve injury was so slight that no demonstrable anæsthesia was present—only an intense hyperæsthesia, varying at times, and liable to be aroused into an intense spasm of pain by a sudden emotion, noise, or vibration or light touch, thereby reminding us somewhat of the onset of the paroxysms in trigeminal neuralgia. The pain is described as of a burning heat—hence the name "causalgia," and bursting sensations in the fingers were common. The pain in many cases lasted for weeks and months, and in some it was necessary to produce nerve-blocking, in order to arrest the pain, by alcohol injection of the trunk of the nerve above the injury. Though common enough during the war, I have seen only one of such cases in civil life in which a man tore his thenar eminence in some cog-wheels two years previously. The pain was limited to the ball of the thumb, and immediate and complete relief was obtained by injecting the median nerve with alcohol just above the wrist. As the nerve lies between the tendons of the flexor carpi radialis and palmaris longus, it can easily be found here and pricked with a hypodermic needle and injected. No other operation is necessary for this.

Painful stump was another very common sequel of amputation in the war.

BRACHIAL AND SCIATIC PERINEURITIS.

Sciatica I have already referred to, especially in association with lumbosacral fibrositis, either of a rheumatic, septic, or traumatic origin.

A very chronic and obstinate type to which I would like to refer is that in which the most noticeable sign on examination is the scoliosis, a lateral flexion of the spine away from the painful side, causing the hip on the affected side to stick out. The lower cervical spine may be as much as 5 in. to one side of the vertical median line when the patient is standing. This scoliosis disappears on sitting or lying. It is a result of a local lumbar fibrositis in the erector spine in the region of the fourth and fifth lumbar transverse processes. Occasionally a definite area of deep tenderness can be localized and it is sometimes possible to procure an immediate and dramatic relief by alcohol puncture of the spot. Short of that treatment these cases are very chronic and resistant to ordinary treatment, and three months' rest in bed may be necessary.

Brachial neuritis is seldom so chronic as some of the sciaticas, though the acute form is probably more painful, due I think to the structure of the cords of the brachial plexus being denser and firmer than the sciatic and thus admitting of less swelling in inflammation of the sheath. This point is easily demonstrated in the dead body by cutting down on the sciatic and brachial nerve trunks and injecting fluid through a hypodermic needle. The sciatic takes it easily and swells up in an egg shape, but it is difficult to force more than a few drops into the main brachial trunks.

Chronic pain about the scapula and arm may be due to cervical rib, or to neurofibrositis, as already stated. A common cause of pain referred from the shoulder down the arm, perhaps to the elbow—its maximum usually about the insertion of the deltoid—consists in adhesions in the shoulder-joint, and resulting from some slight injury such as from strap-hanging, being jerked by getting on or off an omnibus or tram, or a slight fall.

These cases are frequently diagnosed as neuritis. The pain starts usually a day or two after the injury and is due to a synovitis, the subsequent adhesions causing pain with every movement or pressure on the joint. Wrenching under gas, with subsequent

passive movements and massage, usually effect a cure, but some cases are too painful to tolerate the after treatment and partial fixation is permanent. The fixation of shoulder from adhesions subsequent to immobilization during the acute stage of brachial neuritis is to be distinguished from this condition. The history of severe pains and "pins and needles" down to the fingers generally makes this point clear, but the treatment by massage, passive movements, or even wrenching under gas is the same.

DISEASE OF POSTERIOR SPINAL ROOTS OR ROOT GANGLION.

Post-herpetic neuralgia is one of the most inveterate and difficult neuralgias we have to treat. Due in part to an inflammatory lesion in the root ganglion, in some cases to a neuritis of the nerve trunk, and in others even to inflammatory changes in the grey matter of the posterior horn in the spinal cord, the pain is constant and wearing, causing great depression.

Rare under the age of 50, chronic neuralgia following an attack of shingles is increasingly common in older people. In some the pain may persist for months and then gradually disappear, but in others it may remain for years and it has led to suicide. With the pain is usually a severe numbness and constriction, and the area of scarring is usually partially anæsthetic. Beyond local anodynes and mild tonic treatment I hesitate to suggest more active measures. Alcohol injections in spinal cases are, I consider, quite useless, and division of posterior roots after laminectomy is, I believe, not always successful. I should be glad to hear experiences of surgeons on this point.

Herpes of the trigeminal area is mostly limited to the ophthalmic division, often called frontal herpes. A common sequel is numbness, sensation of constriction and paræsthesia of formication, not really amounting to pain. Occasionally, however, in old people subsequent neuralgia in the anæsthetic area is very distressing and persistent. For this, alcohol injection of the Gasserian ganglion may give complete relief, and I have done this in three such cases, but it is necessary to produce total and lasting anæsthesia equal to that resulting from a gasserectomy.

Chronic pain in the limbs, usually the lower limbs, may result from posterior root sclerosis, subsequent to meningitic lesions. *Hæmatorachis* or intraspinal hæmorrhage in the lumbo-sacral region may result from heavy muscular effort. The effused blood is apt to clot around the roots of the cauda equina and cause chronic irritation and pain in one or both lower extremities, with wasting and loss of reflexes, and possibly diminished sensibility. Lumbar puncture will clear up the diagnosis, a straw-coloured cerebro-spinal fluid being drawn off even a year or more after the onset. In one such case I had laminectomy performed and a large purple clot 4 in. long surrounding the roots of the cauda equina removed, eighteen months after the injury.

Tabetic pains are too well known to need discussion. Their treatment is perhaps less satisfactory. Mercurial friction improves some, intravenous salvarsan others, while in the case of those who do not notably improve under salvarsan only, I have seen considerable numbers benefit immensely, as regards severity of pain, by intraspinal injections of the serum taken from the patient's blood after intravenous salvarsan.

Usually there is a strong reaction about two hours after the injection of 50 to 55 c.c. of the serum, severe pains in the limbs coming on and lasting twelve to twenty hours, followed by more or less complete relief, which may last for years. Presumably the injection of the serum sets up some congestive state in the posterior nerve roots which acts beneficially on the chronic syphilitic neuritis which is the source of the pain. Root sclerosis may be due to other causes, such as hæmorrhage, toxic degeneration in diabetes, and other causes of neuritis.

Proceeding centrally, we find chronic neuralgic pains resulting from intra-medullary lesions affecting the fillet and thalamus. Usually the pain is constant, burning, and "pins and needles" in character, but occasionally it is paroxysmal and neuralgic.

More than ten years ago¹ I showed before this Section a man of over 60, who had suffered from an attack of thrombosis of one posterior inferior cerebellar artery. As a result of the thrombosis implicating the side of the medulla with the fillet and the descending or spinal root of the fifth nerve, there was analgesia of the left fifth area and of the right half of the body, excluding the face and the forehead. In the analgesic area of the left fifth he complained of constant neuralgic pain, which nothing appeared to relieve. It is perhaps difficult to understand how a simple sclerotic lesion can cause persistent neuralgia in the absence of any irritating focus. This is the only instance of this posterior inferior cerebellar syndrome which I have seen with permanent neuralgia resulting, though this particular thrombosis does not appear to be very rare, as I have met with twenty or more cases. It has been suggested that the persistent burning pain and paræsthesiæ in lesions of the thalamus or fillet are due to the spontaneous unrestrained activity of these nuclear centres for sensation. Similar pain is met with in some cases of syringomyelia and syringobulbia, pain referred to analgesic areas or *analgesia dolorosa*. Intramedullary spinal tumours also are liable to cause a burning pain as an early symptom, which may precede for many months any more definite localizing signs.

PSYCHALGIA.

Pain of mental origin is usually distinctive in character, such as the vertical pressure pain, or *clavus hystericus* of some neurasthenic headaches. A mental neuralgia may usually be distinguished from a true neuralgia of peripheral origin by its distribution not being anatomical in form and overlapping other nerve areas, and especially in crossing the middle line.

A parson, aged 63, for two and a half years has had pain in the right great toe. Of three surgeons who saw him, one operated for exostosis, the second excised the joint, the third told him he had a kink in his colon, but let him off with an abdominal belt and paraffin internally, and advised him to get a tendon cut. In spite of all treatment (or because of it) his pain is now much worse. On inquiring into his history, I found he was the child of first cousins, and that insanity was very prevalent in his family. As I could see nothing wrong with his foot or leg, I have little doubt that this pain was an instance of psychalgia. Occasionally there may be difficulty in diagnosis, as in a Jewish patient whom I saw for pain on the left side of the cheek and forehead and nose, but crossing the nose as far as the inner canthus of the opposite eye. He was anxious for injection treatment, and as he had had much medicinal treatment without benefit, somewhat against my better judgment I injected his second division. Although dense anaesthesia resulted, the pain was not improved, rather the reverse. I then hesitated between advising suggestion treatment and injection of the ganglion. He would not have the former, and again against my better judgment I injected him, this time through the foramen ovale, producing total and permanent fifth nerve anaesthesia. His eye and cornea fortunately gave no trouble, but he was now complaining even more of the pain, and he went to see another surgeon regarding gasserectomy; this surgeon, however, refused to do the operation when he found the fifth nerve area totally anaesthetic. The patient went to yet another surgeon who operated to remove his ganglion; and the last I heard of him was that he was still complaining violently of pain.

The moral of this tale is that it is unwise to attempt any form of surgical treatment for psychalgias; the pain is apt to get worse, or spread to another area, and once an operation has been performed, it is most difficult for another practitioner to sift the real from the false and make a diagnosis. With the psychalgias may perhaps be included many of the *coccygodynias*, though perhaps in the majority of these there is a history of some local injury at the outset.

DISCUSSION.

Dr. GORDON HOLMES said that it was the teaching of English neurology that most diseases of the central nervous system which did not involve the meninges or extend to the posterior or other sensory roots ran a painless course. That that doctrine was true in the majority of cases there could be no doubt, but he was afraid it had been applied

¹ *Proceedings*, 1910, iii (Sect. Neurol.), p. 81.

rather too widely. It was generally assumed that spinal diseases could produce pain only when the posterior roots were involved, but as a result of his war experience of gunshot injuries he thought it must be regarded as a possibility that a traumatic injury of the pain-conducting tracts within the spinal cord could produce pain, persisting for several weeks at least. It was not so rare for intramedullary lesions of the cord to produce pain as it was generally assumed to be. Perhaps the most interesting point from the theoretical side concerned the manner in which these pains occurred. It was an old hypothesis that the lesion irritated the pain-conducting fibres, and therefore gave origin to the pain which was peripherally referred or projected. He did not think that many of them were willing to accept that explanation now. He had found in certain gunshot injuries of the spine that not merely painful or uncomfortable sensations were produced, but also an excessive sensation of what might be called pleasure on the affected parts of the body. The easiest working hypothesis in discussing the nature of the central pain was to assume the view put forward years ago by Long, that the pain-conducting fibres throughout the central nervous system were represented by chains of neurons broken up repeatedly into masses of grey matter, and that the pain was due to some structural or dynamic change in portions of grey matter in which the pain-conducting fibres were normally interrupted.

Dr. S. A. KINNIER WILSON said that if it was the case that the tic movement of a tic douloureux disappeared when the neuralgia was relieved—whether it was a tic or spasm was for the moment immaterial—it seemed as though certain inveterate cases of torticollis might be treatable by the relief of the accompanying occipital neuralgia by operation on the posterior ganglia. Torticollis was a very interesting subject, and often cases of torticollis were particularly untreatable. He also referred to the description in Dr. Harris's paper of certain patients whose pains came on only at certain times of day (for example, a woman who had the pains from 12 to 5 o'clock each day). These cases presented very interesting problems from a theoretical point of view. The view he himself took was that such cases were essentially psychogenic. He did not believe that any factor except one of that nature could produce the recurrence of pain over the same period of hours every day. He added that he had used ionization successfully in several cases of post-herpetic neuralgia when other forms of treatment had been unsuccessful.

The PRESIDENT said that his own experience of posterior root section had been extremely disappointing, and on very few occasions had it been worth doing; especially was this true of doubtful cases of persistent pain of causalgic character. Every kind of surgical treatment for the relief of these pains had been tried, and all had had a measure of success, but on the whole there was more disappointment than otherwise. Unless the nerve could be dealt with at a high level and at an early stage, there was little likelihood of any great result from alcohol injections, resection of the nerve, or anything of the kind, and after the pain had persisted for years, then the posterior section itself had very little influence.

Dr. WILFRED HARRIS, in replying to the point raised by Dr. Wilson as to the periodicity of the pain, would not subscribe to the opinion that the periodicity meant psychalgia. Periodic pain was familiar to many of them in other connexions. Moreover, the pain in this case had an anatomical distribution, and, contrary to the usual results in psychalgia, injection of the ganglion produced almost complete relief.

On Persistent Pain.

By Sir WILLIAM THORBURN, K.B.E., C.B., C.M.G., F.R.C.S.

THE treatment of a symptom always rests upon a more uncertain basis than does the treatment of a lesion. More especially is this the case with such a symptom as pain, which is not only purely subjective, but the nature and intensity of which are not capable of measurement or even of definite expression.

Hence the estimation of the results of treatment requires considerable caution. On the one hand, such results may be due merely to suggestion, as was probably the case with alleged "cures" of tabetic pains by suspension or by stretching of the sciatic nerves—methods which I take to be now quite obsolete. On the other hand an operation which has certainly removed the pain to which it was directed—such as gasserectomy for trigeminal neuralgia—may be followed by the most disagreeable phenomena of "psychalgic" origin. Thus I have seen removal of the Gasserian ganglion followed by a functional hemianæsthesia, and in two typical cases of rib-pressure removed by operation the patients shortly developed abdominal troubles associated with a well defined movable kidney. As, moreover, many of the cases operated upon for persistent neuralgia are the victims of alcohol, morphia or other narcotic drugs, the picture is often obscured by such conditions, and again the judgment of operation results may be thereby rendered extremely difficult.

We are, therefore, on the safest ground when we are attacking a quite definite lesion, as in removing a source of pressure. We are less certain of results when dealing with root ganglia, whether spinal or cerebral; and we are on the most doubtful ground when dealing with diseases of obscure pathology, such as are many of the neuralgias of the limbs.

With regard to pressure lesions, including those of the dome of the thorax, we are on very safe ground, and in nearly all, if not all cases, the removal of the cause will prove curative. The treatment thus resolves itself simply into the recognition of the cause. It is, however, possible, if not probable, that in cases of long standing there has been produced a local neuritis with cicatricial changes which may lead to permanent symptoms, although pain is seldom prominent among these.

With regard to pain due to external injury, the most typical examples are those due to end-bulbs after amputation. The relief of such pain is generally immediate if the bulbs be excised, but in some cases little or no benefit will follow, and even high resection of the affected nerves will fail to cure.

In such cases there is again probably an extensive septic neuritis as described, especially by Corner, and for some of them posterior rhizotomy appears to offer the only hope of relief. A good deal of controversy has arisen as to the prevention of such end-bulbs, but my own opinion, founded upon a considerable experience of amputations dating back to a time when many were not aseptic, is that their essential cause is simply sepsis, and that section of the nerves at a high level at the time of amputation is a sufficient prevention even in septic wounds. I have not practised any of the methods of occluding the cut ends of the nerves, and I am not aware that their omission has given rise to trouble. Upon this point, however, I should greatly like to hear the experience of those who have worked in British hospitals during the war.

With regard to causalgia, again, the views of those who have had British war experience would be most welcome to me. So far as I can judge Sicard's method appears to be most popular, although I have no personal experience of it. It has, however, one fairly obvious limitation. When the injury lies near to the trunk the neuritis may well have extended so far that it is impossible to inject the nerve above it, and it would then again appear reasonable to fall back upon rhizotomy. Similarly resection and suture may quite fail to cure and may leave rhizotomy as our only hope. (Platt found that of twenty cases treated by resection and suture sixteen were cured and one failed even after repetition of the operation, while of three treated by neurolysis only one was cured.)

Rhizotomy is, however, by no means always effective in this and other severe forms of neuralgia of the limbs. The analysis of Foerster and of various British surgeons given in the *British Journal of Surgery* yields fifty-nine cases, twelve of which died or were not traced, while twenty were cured, and in twenty-seven there was either no relief or such relief was partial only. Of two cases of my own one was little if at all relieved, and it is interesting to note that this was a case of avulsion of the brachial plexus in

which there was no open wound or septic infection, and in which it was obvious at the time of operation that the roots were matted together by a cicatrix, and that some cicatricial tissue extended into the spinal cord. Here we have a probable clue to the many failures, viz., an extension of disease beyond the posterior root-ganglia.

Before leaving the question of injuries of nerves, I should like to refer to the often very painful cicatrices of the scalp. Why these should cause much pain—sometimes ensuing long after the original injury—is not obvious, but I am strongly inclined to attribute it to attachment of the mobile scalp to the skull, and I have certainly found that freeing of the scalp, with or without interposition of some material, such as cergile membrane or aseptic wax between it and the bone, is followed by the relief of pain and of other nervous symptoms often associated with it.

Turning now to the brachial, sciatic and other neuralgias of more obscure pathology, these are of course widely treated by non-operative measures or by such measures as acupuncture, saline injections and "bloodless" stretching. Many of the cases recover as do many under the influence of rest alone, and I do not wish to dispute that all these methods have been followed by good results. But in the cases which come before me they have usually been tried and have failed. Hence, perhaps, I am strongly prejudiced in favour of a full exposure of the nerve. Such an exposure is free from risk and often reveals a definite lesion such as a source of pressure or a perineuritis with light adhesions. Neurolysis, doubtless associated with some stretching, is at least as likely to be curative as the more obscure attacks of apparently minor surgery, while it certainly provides a more complete and logical line of therapeutics. In many, but by no means all cases, it has given very good results.

Lastly, I must refer to ganglionic and tabetic pains.

As regards trigeminal neuralgia the various modern methods are so well known that it is unnecessary to do more than briefly refer to them.

There are two great classes of operation. Schloesser's method of injection and Hutchinson's method of removing the two lower thirds of the ganglion have the merit that, so far as I know, they never imperil the eye, and in my own experience Hutchinson's operation has always been permanently curative. It would, however, be useless in the rare cases in which the ophthalmic division is involved. On the other hand, Haertel's method of injection, total ablation of the ganglion and resection of the sensory root have, to my knowledge, all caused loss of the eye even when performed by the most competent operators. Haertel's injection is the simplest and the safest as regards life, but appears to me the most uncertain, and does not commend itself to one who likes to see what he is doing. Division of the posterior root—especially by Adson's technique—will probably supplant total gasserectomy, but so far I have always been satisfied with Hutchinson's method.

Post-herpetic neuralgia I have found surprisingly disappointing, but both my own and the recorded cases of root resection for this condition are too few for safe generalization at this time. Rhizotomy would appear to offer the best hopes of cure, but here again it may well be that changes have extended above the level of the root ganglia.

Tabetic pains are becoming increasingly rare, probably as a result of the better early treatment of syphilis. Foerster and Hey Groves have between them collected seventy cases with seven deaths, fifty cured or greatly improved, and thirteen failures. Such results are well worth obtaining, especially as the death-rate is very much lower in the hands of surgeons accustomed to laminectomy, and there is also not a little evidence that spinal drainage, *per se*, is of value in locomotor ataxia. Moreover, several of the failures have been clearly due to a too limited resection of roots. Such resection, to be effective, should probably include at least the fourth, and eighth or ninth thoracic roots in cases of gastric crises, and should generally be bilateral. I am quite satisfied that, if it be thoroughly carried out, we have in this operation one of real value which ought to be considered in every case of tabetic pain, and which ought, in the hands of experienced surgeons, to be as safe as an exploratory laparotomy.

Section of Neurology.

President—Mr. PERCY SARGENT, C.M.G., D.S.O., F.R.C.S.

Microscopic Examination of the Brain in Cases of "Surgical Shock."

By Sir FREDERICK W. MOTT, K.B.E., M.D., F.R.S., and
T. UNO, M.D. (Tokio).

THE material examined consisted of brains sent from France during the war. It comprised: (1) Four cases of shock from shell wounds with extensive laceration of the tissues and compound comminuted fracture. (2) A case of death from shock caused by extensive petrol burns. (3) Shock from bruising of heart and trivial shell wounds.

The brains in category (1) had been placed in 10 per cent. formalin before being sent from France, and arrived in good condition.

Pieces from different parts of the brain were taken, hardened in alcohol, cut by the paraffin method, and sections stained by various Nissl methods to show the condition of the nerve cells, and also by the Van Gieson method to show the condition of the blood-vessels.

Pieces were also taken, cut by the freezing method, and the sections stained by the Scharlach R. and the Nile Blue methods to demonstrate fat.

Case I.—Wounded on night of May 1, 1918; admitted at 2 a.m. on May 2 in a pulseless condition. He was warmed up, and later given an infusion of 450 c.c. of 6 per cent. gum acacia solution. Remained cold and pulseless in spite of all attempts at treatment, and died at 6 a.m. on May 2. Autopsy at 12 noon on same day.

This man had severe multiple shell wounds of both arms and right leg. The right arm was greatly lacerated, the humerus being splintered in all directions and much muscle damaged. The autopsy revealed nothing abnormal in any of the viscera. The brain was very wet on section.

This case was regarded as one of shock, combined with moderate hæmorrhage.

Microscopical Examination.

Motor Cortex stained by the Nissl Method.—The pyramidal cells of the different layers show marked perinuclear chromatolysis; the Nissl granules in the other parts of the cells do not stain well, and are clumped together in an irregular manner. In many of the cells the nucleus is swollen, in others the nuclear membrane is broken, also the cellular membrane. Some of the cells show a number of vacuoles in the cytoplasm. The perinuclear chromatolysis is most marked in the Betz cells.

In many of the cells the nuclear membrane is so indistinct that the nucleus seems to merge into the cytoplasm of the cell. In some of the cells the chromatolysis is so complete that only a small amount of basophil substance can be seen forming a fringe on the periphery of the cell. This condition is very well seen in the Betz cells, where

there is complete chromatolysis, except for the fringe of granules around the periphery of the cell.

The nucleus is so swollen in many of the cells as to appear to occupy nearly the whole of the cell, and in many others the nucleus is excentric. In most cells the pericellular space is dilated and occupied by phagocytic cells. All the cells show some degree of change and in no place is it possible to find a cell which shows the normal staining reaction or normal Nissl granules.

By the Van Gieson method many of the vessels are seen to be collapsed and empty, with the perivascular spaces distended, presumably filled with the cerebro-spinal fluid. Very few of the vessels contain any blood (*see* photomicrograph, fig. 1). Frozen

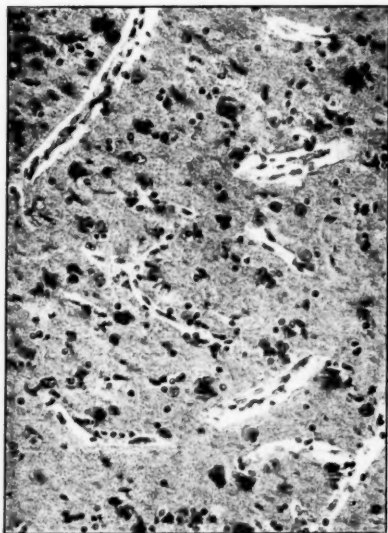


FIG. 1.

PHOTOMICROGRAPH, FIG. 1.—Section of cortex, showing empty vessels with dilated perivascular space. (Magnification 200.)

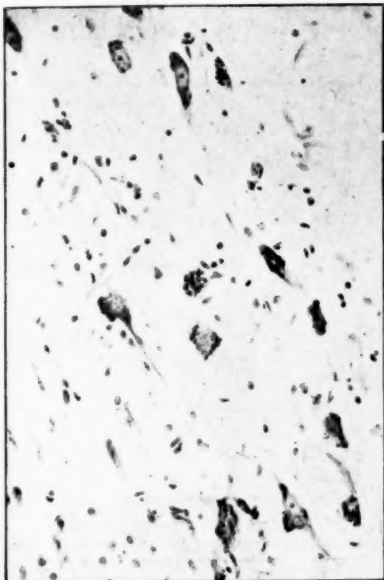


FIG. 2.

PHOTOMICROGRAPH, FIG. 2.—Dorsal nucleus of the vagus, stained Nissl method, showing varying degrees of perinuclear chromatolysis, swelling of the nucleus, and the Nissl granules clumped irregularly at the periphery of the cell. (Magnification 200.)

sections of the cortex stained by the Scharlach R. and the Nile Blue methods show fat granules in many of the small vessels in the white matter. There do not appear to be any lipid granules in the nerve cells.

Medulla stained by the Nissl Method.—The cells in the medulla show changes similar to those observed in the cortex. Some nuclei are more affected than others. The dorsal nucleus of the vagus shows marked perinuclear chromatolysis, swelling of the nucleus, and the Nissl granules are clumped irregularly at the periphery of the cells (*see* photomicrograph, fig. 2). In some of the cells the nuclear and cellular membrane is broken.

Stained by the Van Gieson method, some of the vessels are seen to be collapsed and empty, whilst others contain plenty of blood. There is the same distension of the perivascular space as seen in the cortex, and many of the vessels show an extravasation of blood into the perivascular space, and in some places the blood has penetrated into the surrounding tissue and formed a hæmorrhage. By the Scharlach R. method some of the vessels show fat emboli (*see* photomicrograph, fig. 3, and Plate I, fig. 1). No lipoid granules seen in the nerve cells.

Basal Ganglia.—By the Van Gieson method the vessels show a similar condition to that seen in the cortex and medulla.

By the Scharlach R. method some of the vessels in the internal capsule and optic thalamus show distinct fat emboli (*see* Plate I, fig. 2). No lipoid granules seen in the nerve cells.

Cerebellum stained by the Nissl Method.—Most of the Purkinje cells are swollen



FIG. 3.

PHOTOMICROGRAPH, FIG. 3.—Section of medulla stained by Scharlach method, showing a (black) collection of fat which is contained in a vessel. (Magnification 200.)

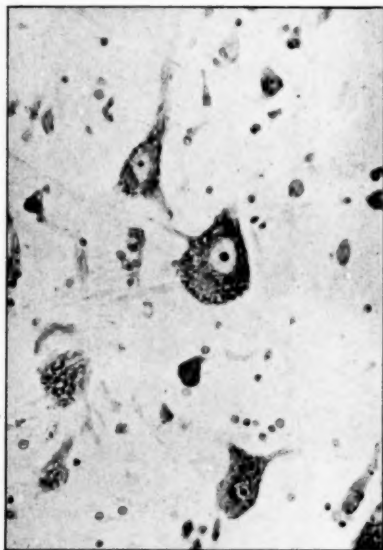


FIG. 4.

PHOTOMICROGRAPH, FIG. 4.—Section of motor cortex area, showing early chromatolytic changes of the Betz cells of variable intensity. (Magnification 400.)

and show a certain amount of chromatolysis. The Nissl granules stain very poorly and are massed together at the periphery of the cell in an irregular dust-like manner. The nucleus is also swollen, and in many cases the nuclear membrane is broken. The granules also appear very pale and do not show the normal staining reaction.

Van Gieson.—By this method there does not appear to be the same vascular change as that observed in the cortex and the medulla.

Scharlach R.—The sections examined do not show any fat emboli, nor any lipoid granules in the cells of any of the preparations.

WOUND SHOCK (SURGICAL SHOCK).

Case II.—Admitted on April 30, 1918, with a severe compound fracture of the femur from gunshot wound of the right thigh. The wound was a huge one through the upper part of the thigh, and the trochanters of the femur were involved in the smash. The muscles in the upper part of the thigh were very extensively lacerated. On admission the man was very cold, and no pulse could be felt at the wrist. Intravenous injection of 6 per cent. gum solution, combined with stoving, &c., made not the slightest difference. He died at 9.45 p.m. on the day of admission, probably about eight or at the most ten hours after being wounded.

There had been considerable hæmorrhage from the wound in this case, but the femoral vessels were intact.



FIG. 5.

PHOTOMICROGRAPH, FIG. 5.—Section of motor cortex area, showing early chromatolytic changes of the Betz cells of variable intensity. (Magnification 400.)



FIG. 6.

PHOTOMICROGRAPH, FIG. 6.—Section of dorsal nucleus of vagus, showing perinuclear chromatolysis and excentric nucleus. (Magnification 400.)

At autopsy the brain was wet. Nothing else abnormal except the brownish dirty appearance of the medulla of the suprarenals.

Microscopical Examination.

Motor Cortex stained by the Nissl Method.—The majority of the small and large pyramidal cells do not show such a marked chromatolytic change as seen in Case I; probably the time which elapsed between the injury and death was shorter and accounted for this fact. Many of the cells show a fair amount of basophil substance,

although it is not arranged in the normal Nissl pattern but is clumped together in an irregular manner. The nucleus is not very distinct and seems to merge into the cytoplasm of the cell. Most of the cells show a marked vacuolation of the cytoplasm. Amongst these cells there are a number of cells which can hardly be recognized as cells, as they are almost completely destroyed, only a faintly stained outline being seen. All the pericellular spaces are dilated and contain a number of satellite cells. Some of the largest pyramidal cells do not seem as much affected as the medium and small; they seem to retain their colour better, although all of them show some degree of chromatolysis. The Betz cells seem to be the least affected, some of them showing very little change in appearance, whilst others in the same group show more marked chromatolytic changes (*see* photomicrographs, figs. 4 and 5).



FIG. 7.

PHOTOMICROGRAPH, FIG. 7.—Section of ventral nucleus of vagus, showing marked perinuclear chromatolysis and excentric nucleus. The cells of the adjacent hypoglossal nucleus show the Nissl granules to be fairly normal. (Magnification 400.)

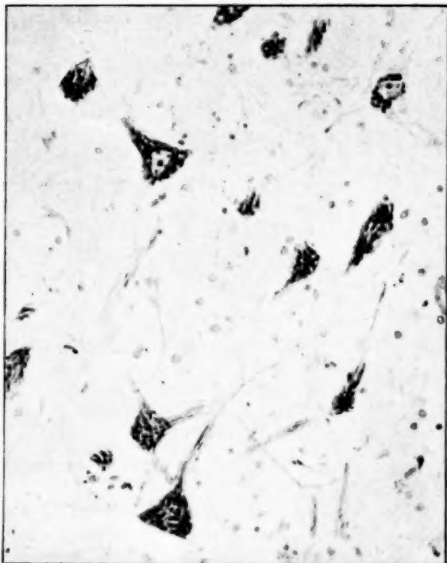


FIG. 8.

PHOTOMICROGRAPH, FIG. 8.—Cells of hypoglossal nucleus, showing Nissl granules. (Magnification 250.)

Cortex: Van Gieson Method.—Some of the capillaries are collapsed and empty but not nearly so marked as in Case I. The larger vessels seem to be quite normal in appearance and are filled with blood, and this also applies to the vessels in the meninges. No hæmorrhages are seen, but a few show an escape of blood into the perivascular space.

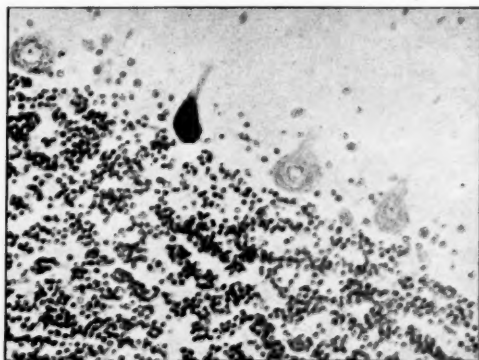
Cortex: Scharlach R. Method.—Many of the pyramidal cells show fine lipid granules in the cytoplasm. This is especially marked in Betz cells which show quite a large collection of lipid granules in each cell. A few small fat emboli are seen in some of the smaller vessels in the grey matter. Two or three small hæmorrhages are seen in the sections stained by Scharlach.

Medulla: Nissl Method.—Most of the cells in the medulla show change with varying degrees of chromatolysis. In some nuclei, especially the autonomic, the cells show a marked change. The Nissl granules being absent, with the exception of a thin layer at the periphery of the cell, the nucleus is excentric, and in one or two cells almost extruded (see photomicrographs, figs. 6 and 7, dorsal and ventral nuclei). The cells of the adjacent hypoglossal are normal in appearance showing the Nissl granules quite distinctly (see photomicrograph, fig. 8, and Plate II, fig. A).

Medulla: Van Gieson Method.—Some of the vessels are collapsed and empty with the perivascular space dilated, whilst others, few in number, appear normal and filled with blood. No hæmorrhages can be seen.

Medulla: Scharlach R. Method.—A number of small fat emboli are seen in the smaller vessels, but not nearly so marked as in Case I. Sections of the pons at junction with medulla show a number of small and large fat emboli.

Cerebellum: Nissl Method.—Very few of the Purkinje cells show the normal staining reaction, most of them show some degree of chromatolytic change. In most of the cells the Nissl granules are broken up into a fine dust, the cell is swollen, the



PHOTOMICROGRAPH, FIG. 9.—Section of cerebellum. Three of the Purkinje cells show almost complete absence of basophil substance, and one shows hyperchromatosis. (Magnification 350.)

nucleus indistinct, and the whole cell is only faintly stained, whilst in the immediate neighbourhood one can see cells which present a more normal appearance (see photomicrograph, fig. 9). Some of the cells show hyperchromatosis (see fig. 9). The granules appear to be well stained.

Van Gieson Method.—There is very little vascular change to be seen; some of the smaller vessels and capillaries are collapsed and empty with dilatation of the perivascular space, but most of the vessels appear to be full of blood. No hæmorrhage can be seen.

Scharlach R. Method.—No lipid granules can be seen in the Purkinje cells. No fat emboli found.

Basal Ganglion.—Sections of the optic thalamus stained by Scharlach R. method show a few fat emboli.

WOUND SHOCK.

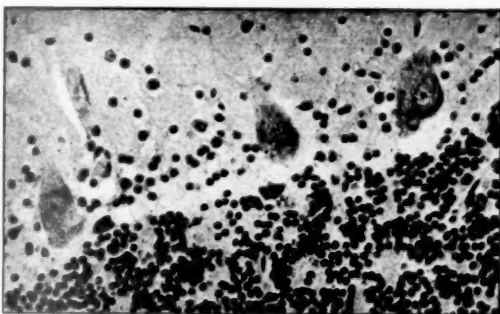
Case III.—Admitted on May 9, 1918, with severe gunshot wound of leg, fracturing and smashing the tibia. A supracondylar amputation was performed at once, and then owing to enemy shell fire the case had to be transported a distance of some miles on an ambulance. When seen on admission after the journey by car the patient was very

pale and quite pulseless. He was transfused with 500 c.c. of blood from a suitable donor, but never showed any sign of rallying. He died the day after admission, about twenty-four hours after the wound.

Nothing abnormal found at autopsy. Brain in this case firm and rather dry. This fact may be correlated with the statement that he was *very pale* and although it is not stated in the notes, there had probably been great loss of blood.

Microscopical Examination.

Motor Cortex by Nissl Method.—The small and medium-sized pyramidal cells are very faintly stained; there is considerable chromatolysis, the Nissl granules are broken up and are only visible at the periphery of the cell. The nucleus is swollen, often indistinct, and there is a good deal of vacuolation of the cytoplasm of the cell. The pericellular space is dilated and contains a number of satellite cells. The large pyramidal and Betz cells do not seem to be so much affected, most of them stain very well and there is only a slight chromatolysis. Some of the Betz cells are quite normal in appearance showing the Nissl granules quite distinctly.



PHOTOMICROGRAPH, FIG. 10.—Section of cerebellum, showing chromatolysis of Purkinje cells. (Magnification 400.)

Van Gieson Method.—Many of the small vessels and capillaries are collapsed and empty with dilatation of the perivascular space. Some of the smaller vessels are filled with blood and in some vessels there is an extravasation of blood into the dilated perivascular space due to the rupture of the vessel wall. In some places the blood has penetrated into the surrounding tissue and formed small hæmorrhages.

Scharlach R.—A few small fat emboli are seen in the capillaries and small vessels.

Medulla: Nissl Method.—The cells in the dorsal and ventral nuclei show similar changes to those seen in Cases I and II. There is a marked chromatolysis, only a small amount of basophil substance remaining at the periphery of the cell. The nucleus is swollen, indistinct and excentric (*see* photomicrograph, fig. 11, dorsal nuclei). The cells in the adjacent hypoglossal nucleus are quite normal in appearance, with the Nissl granules staining well and quite distinctly.

Van Gieson.—The vascular change is in all respects the same as seen in the motor cortex.

Scharlach R.—No fat emboli seen in any of the vessels or capillaries.

Cerebellum: Nissl Method.—The Purkinje cells show similar changes to those described in Case II (*see* photomicrograph, fig. 10).

Van Gieson.—There is apparently no vascular change; the vessels are well filled with blood and no hæmorrhages are seen.

Scharlach R.—A few small fat emboli are seen scattered about in the small vessels and capillaries.

SURGICAL SHOCK.

Case IV.—Wounded on May 3, 1918. Admitted the same day with right leg completely crushed, and compound fractures of tibia and fibula. The missile was a large fragment of shell. There had been a little hemorrhage in this case owing to the nature of the injury, but on admission the man was absolutely pulseless, pallid and very cold. In spite of all treatment he never showed any sign of rallying and died at 10.30 a.m. on May 4.

Autopsy very soon after death. No abnormalities were found, but here again the brain substance was quite abnormally wet.

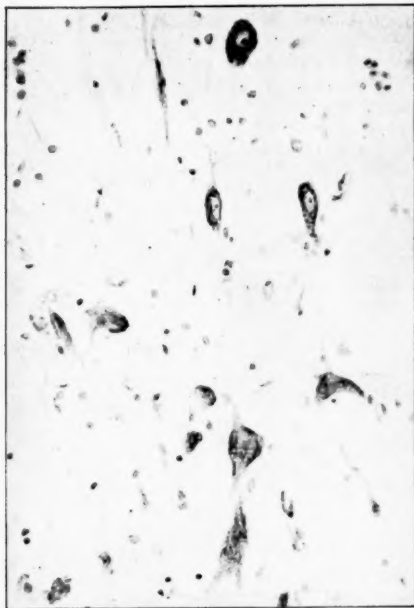


FIG. 11.

PHOTOMICROGRAPH, FIG. 11.—(Case III). Section of dorsal nucleus of vagus, showing perinuclear chromatolysis of some of the cells. (Magnification 350.)

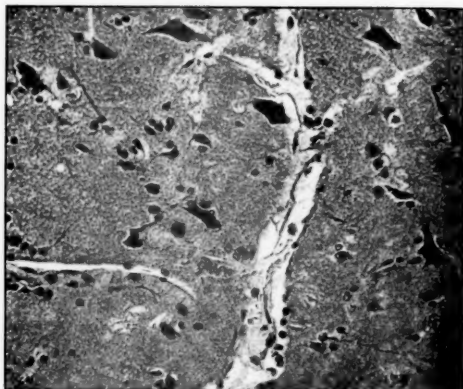


FIG. 12.

PHOTOMICROGRAPH, FIG. 12.—Motor cortex, showing collapsed vessels with dilated perivascular spaces. (Magnification 200.)

Microscopical Examination.

Motor Cortex: Nissl Method.—In this case only the cerebrum was sent, so no examinations could be made of the medulla and cerebellum. The small and medium size pyramidal cells show varying degrees of chromatolysis; most of them are stained very faintly; the nucleus is indistinct and so swollen that it often occupies the whole of the cell. There is very little basophil substance to be seen, and many of the cells show vacuolation of the cytoplasm. The pericellular space is dilated and contains satellite cells. There are, however, a few cells which are well stained and in which the Nissl granules are quite distinct. Some of the large pyramidal cells show a more

marked change. The Nissl granules are absent and only the faint outline of the cell can be seen. The Betz cells seem to be least affected of all; most of them are well stained and there is only a slight degree of chromatolysis as compared with the pyramidal cells.

Van Gieson.—Some of the capillaries and small vessels are empty and collapsed with the perivascular space dilated, but many of the vessels are filled with blood and show no change. No hæmorrhage can be seen.

Scharlach R.—There are a few small fat emboli to be seen in some of the smaller vessels.

Case V.—50586 Private S., C/91 Brigade, R.F.A.—Wounded October 23, 1918. Small shell wounds right hand and foot and upper lip. Admitted with profound shock. "Gum solution" 600 c.c. given. Patient died October 24, evening.

Autopsy (October 25, 10.30 a.m.).—Left chest wall showed bruising over situation of heart apex. No fracture of ribs and no apparent bruising of overlying lung. Heart much dilated. Definite bruising at apex. Lungs normal. Liver, rather pale, slight



PHOTOMICROGRAPH, FIG. 13.—Motor cortex, showing collapsed vessels and marked dilatation of perivascular space. (Magnification 350.)

"nutmeg" appearance. Spleen, pancreas, adrenals had normal appearance. Stomach and intestines normal; no evidence of mesenteric disease. General anæmia. Kidneys, very pale.

Brain was fixed in 10 per cent. formalin solution; after flushing with saline solution it was injected with formalin solution.

Microscopical Examination.

Cerebellum (Van Gieson).—Vessels empty, perivascular and perineuronal spaces well marked; vessels mostly empty, but here and there, instead of being collapsed, a capillary or even a venule can be seen filled with blood with perivascular space. This space can sometimes be seen crossed by fine trabeculae, and it is found continuous, with a space around the large dendrons of the Purkinje cells. Cells of Purkinje are stained unequally; some show a normal amount of basophil substance, in others there is a variable deficiency, from slight and marked to even very marked. Compared with death from anæsthetic there is some chromatolysis.

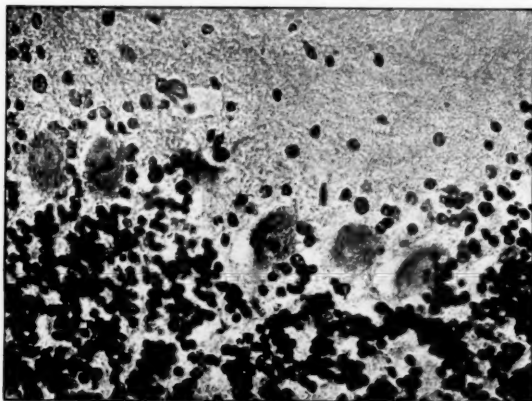
Medulla (Van Gieson).—Vessels same as above. Cells: General diminution of basophil substance in the cells of the medulla; no definite group affected.

Cortex.—Vessels similar. General diminution of basophil substance in cells. No change in form of cells.

The appearance of the cells of the central nervous system is indicative of a general condition of exhaustion rather than a special neuron group or system change. The nuclei are large, pale and distinct. The blocks of chromatin are smaller, more separated and less numerous than normal even in the large cells.

The group of cells of the vagus dorsal nuclei presents a contrast in staining under a low power to that seen in the case of death under anæsthetic. There is a chromatolysis indicative of exhaustion.

Conclusion.—Several factors conspired to produce shock, viz., the emotional effect of the burst of the shell, the multiple wounds, and, most important of all, the bruising of the heart. Probably a piece of the shell struck the chest wall when the heart was in systole against the chest wall.



PHOTOMICROGRAPH, FIG. 14.—Cerebellum, showing chromatolysis of Purkinje cells. (Magnification 400.)

A REPORT ON THE MICROSCOPICAL EXAMINATION OF THE BRAIN OF PRIVATE C.

(Who died from shock, the result of a large superficial burn.)

Brief Clinical Report by Capt. A. E. H. LOVELL, R.A.M.C., No. 20 C.C.S.

Private C. was admitted to No. 20 C.C.S. at 9.30 p.m., suffering from burns from ignited petrol, extending from ankles up to and including buttocks. The accident occurred at 7 p.m. on January 11, 1918.

Condition on Admission.—Respiration 20, pulse, 124. Blood-pressure: Diastolic, 90; systolic, 125. Severe pain. Did not look or seem particularly shocked. At midnight, condition the same. At 3 a.m., January 12 (eight hours after injury), pulseless, not so well, but did not appear very collapsed apart from pulse and vomiting.

Treatment.—Morphia: Two doses, $\frac{1}{4}$ gr., oxygen. Digitalin, $\frac{1}{4}$ pint sodium bicarb. per rectum, and $1\frac{1}{2}$ pints of 1.4 per cent. sod. chlor. and 1 per cent. sod. carb., intravenously, caused no improvement. At mid-day patient was given 6 per cent. solution of gum 15 oz. intravenously. He vomited at end of transfusion and complained of epigastric pain. Heart not dilated. Got worse in himself and bluer. Died at 3.30 p.m.

Hæmoglobin Estimations.—9.30 p.m., 105 (my blood reads 95), finger; 4.40 a.m., 125 and 128 (two tests made), finger; 8 a.m., 120, finger; 10.40 a.m., 130 and 132 (two tests made), finger; 124 (blood from vein).

Post-mortem (two hours after death).—*Brain* and upper three segments of cord put at once into 9 per cent. S.V.R. The vessels were very full of darkly venous fluid blood. *Al blood* in body seemed very fluid, no clots seen at all. *Heart* contracted, seemed rather unduly hard and firm; ventricles empty. Auricles emptied at once of fluid blood. (Hæmoglobin in vein blood, 100.) *Liver* engorged, more noticeable than other organs, almost nutmeg appearance. *Duodenum* normal. *Lungs* some venous congestion, but not very marked. *Urine* no discoloration by blood; trace of albumin. Reduces Fehling (colour change without definite precipitate). No acetone. Right kidney, left kidney and suprarenal, liver, heart (left ventricle): Specimen pieces sent in 9 per cent. S.V.R.

The results of examination of the blood by the estimation of hæmoglobin favours Cannon's exæmia theory of shock.

Microscopical Examination.—The brain had been hardened in alcohol and was not in a very good condition, the alcohol not having penetrated sufficiently. Consequently, only certain portions selected could be utilized for microscopic investigations.

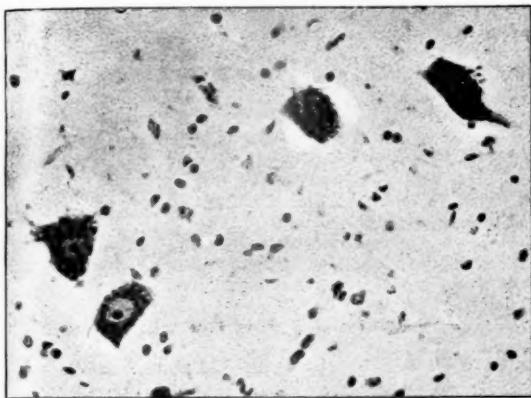


FIG. 15.

PHOTOMICROGRAPH, FIG. 15.—Anterior horn cells of the cervical spinal cord, showing fairly normal appearance of Nissl granules. (Magnification 350.)

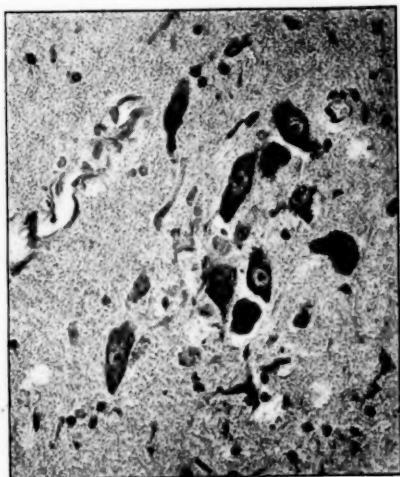


FIG. 16.

PHOTOMICROGRAPH, FIG. 16.—Section of medulla, cells of the vago-accessorial nucleus, showing perinuclear chromatolysis and a marked contrast with the adjacent hypoglossal nucleus. (Magnification 350.)

The appearance of the brain suggested dilated and congested superficial veins with sub-pial hæmorrhage. The microscopic findings showed that this was pretty universal though in unequal degrees over the whole surface of the brain.

The portions of the brain selected, namely, the central convolutions for the Betz cells, the lateral lobe of the cerebellum with dentate nucleus, the pons, medulla, and cervical segment of the spinal cord, were prepared by the paraffin method for sections. The sections were 5 μ in thickness. They were stained by Nissl, polychrome and eosin and Van Gieson methods.

The following is a *summary of the microscopic findings*:—

Vascular Changes.—The superficial veins are everywhere greatly distended and congested, and there are many scattered sub-pial hæmorrhages. As a rule, the

hæmorrhages are only superficial, but one considerable hæmorrhage was found in the lateral lobe of the cerebellum, near the dentate nucleus. There are no punctate hæmorrhages in the white matter of the brain, such as occur in CO poisoning and shell concussion. In many places, both in the cerebrum and cerebellum, but to a less degree in the pons and medulla, there is evidence of collapsed arterioles, venules and capillaries with dilated perivascular spaces. These perivascular spaces can be seen to have connexion with the perineuronal spaces. The appearances present a great similarity to those which I have observed in the brains of animals subjected to ligation of all four arteries of the brain.

The superficial veins of the cerebellum are gorged with blood. There are scattered patches of hæmorrhagic extravasation beneath the pia arachnoid; many of the small arteries, capillaries and venules are collapsed, empty, and surrounded by a dilated perivascular space (see photomicrographs, figs. 12 and 13, pp. 32, 33).

Cell Changes.—Cerebellum stained by polychrome and eosin. Whereas the cells of the granule layer were all stained deep blue, the cytoplasm of the Purkinje cells are red; only the nucleolus takes the basic dye. The cytoplasm and the dendrites are pink and have amorphous appearance (see photomicrograph, fig. 14, p. 34).

Cervical Spinal Cord.—The anterior horn cells show well-marked Nissl granules, although there is some very early commencing chromatolysis. The nucleus is large and clear and the Nissl bodies of basophil substance are not packed closely and show early appearances of breaking up (fig. 15, p. 35). Still the contrast to the cells of the cerebrum and cerebellum is marked.

Medulla.—In the medulla the cells of the motor nuclei show a considerable diminution of the blue staining substance of varying intensity in different cells. The appearances indicate a more advanced (but not complete) chromatolysis than the cells of the anterior horns of the cervical spinal cord. The cells of the vago-accessorius nuclei exhibit more advanced chromatolysis than the adjacent hypoglossal nuclei. Most of the cells of the former show no Nissl bodies and are stained a uniform dull purple, indicative of a considerable biochemical change. All the cells of the pons show a complete absence of Nissl granules and uniform dirty purple staining.

General Conclusions.—The clinical notes of this case show that there was at first a fair blood-pressure and later a great fall in the blood-pressure, for the pulse was hardly perceptible. Two injections were given, one of saline and digitalin, and later one of gum solution, without any beneficial effect.

The collapsed arterioles and venules of the brain are consistent with the great fall in blood-pressure.

The distended superficial veins and sub-pial hæmorrhages are doubtless due to regurgitation of blood from the venous sinuses, to fill up the space caused by the empty vessels in the closed cavity.

The naked-eye changes and the microscopic changes in the blood-vessels and in the ganglion cells are similar to those observed in anæmia of the brain caused by ligation of the arteries. The histological appearances resemble those of shell concussion, except for the fact that I did not discover any punctate hæmorrhages in the white matter. It will be observed that the anterior horn cells of the spinal cord showed distinctly less change than the cells of Purkinje and those of the pons and medulla. Doubtless the low blood-pressure affects the circulation in the brain more than the circulation in the cord.

The post-mortem evidence showed marked venous congestion of the organs, especially the liver and the right side of the heart, which accords with the above explanation.

EXPLANATION OF PLATE I.

FIG. 1.—Section of medulla, showing ependyma of the fourth ventricle, beneath which is a vessel showing fat emboli. (Magnification 400.)

FIG. 2.—Section of optic thalamus, showing ependyma, beneath which are several vessels in longitudinal and transverse section containing fat emboli. Both these frozen sections have been stained by Scharlach R. and hæmatoxylin and mounted in glycerine. (Magnification 400.)

PLATE I.

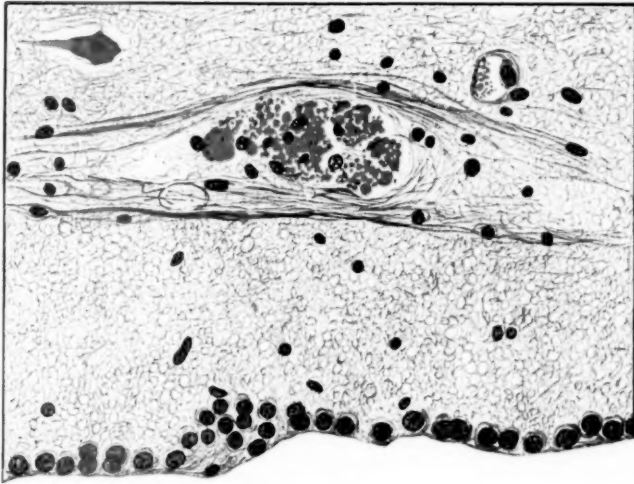


FIG. 1.

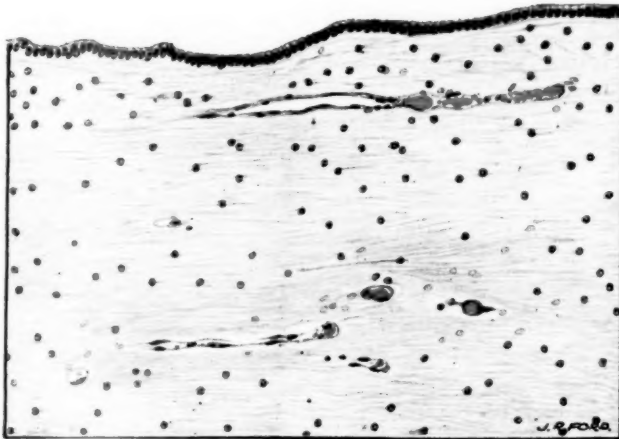


FIG 2.

MOTT and UNO:
Microscopic Examination of the Brain in Cases of
"Surgical Shock."

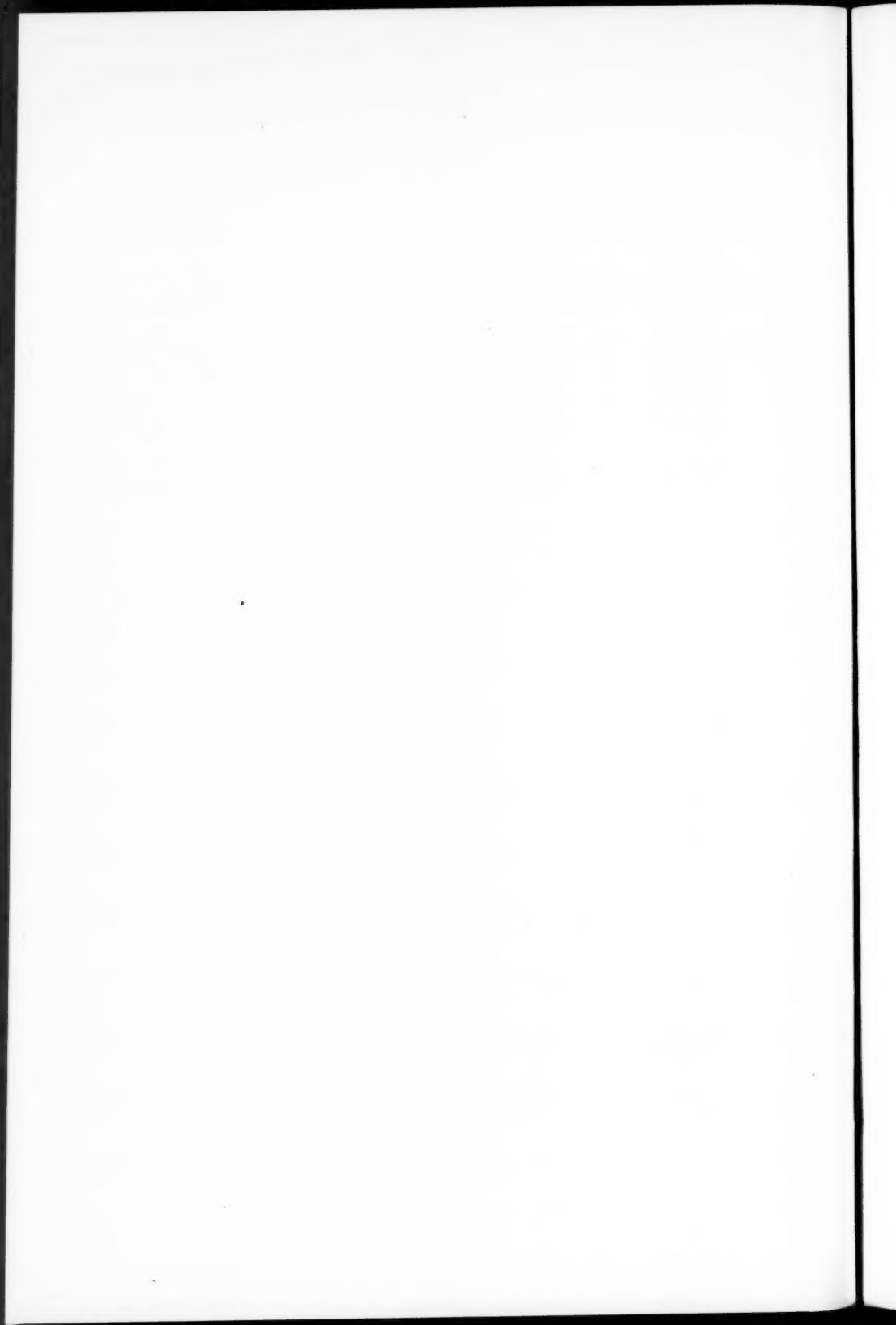
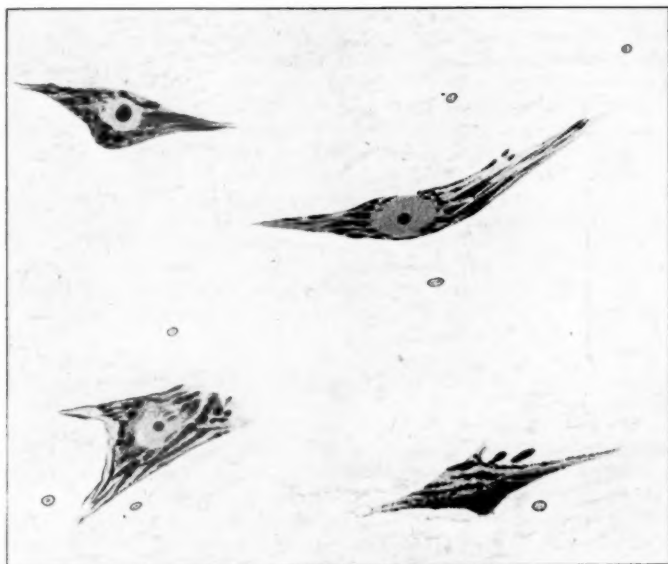
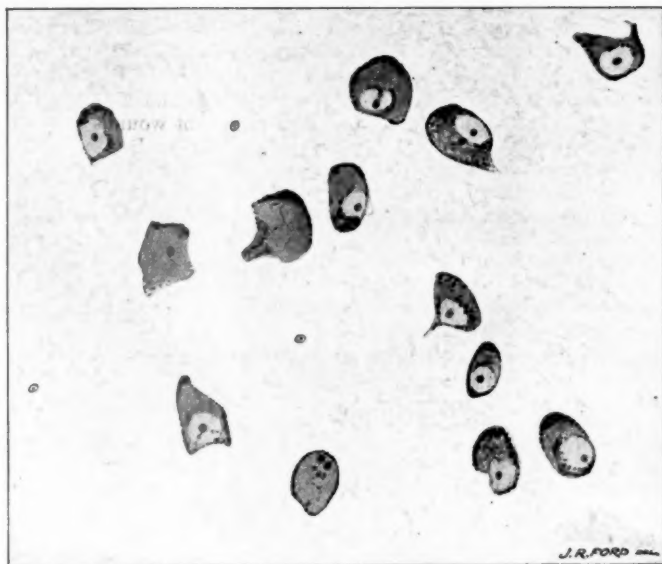


PLATE II.



A



B

Drawing to illustrate the histological appearances of (A) the hypoglossal nucleus and of (B) the ventral nucleus of the vagus. It will be observed that the Nissl granules are present in the former, although there is some diminution of basophil substance, and the nucleus is larger and clearer than normally seen, but the appearance presents a marked contrast to the vagal cells. (Magnification 300.)

(1) NAKED-EYE APPEARANCES OF THE BRAINS IN SURGICAL SHOCK.

We have found that certain similar conditions indicative of cerebral anæmia have been noted to exist in the brains of cases of fatal shock, whether primary, due to shell concussion, or secondary shock following cases of (1) extensive burn, (2) severe gunshot wounds with fracture of bones and much laceration of tissues, and (3) contusion of heart and slight gunshot wounds (one of the four instances of surgical shock), (4) extensive shell wounds. In most instances there was a wet condition of the brain; in one case (Case III) in which the patient probably died of hæmorrhage following amputation, the brain was noted as being dry. In a few cases the superficial veins were noted as being congested at the post-mortem. Similar conditions in the brains of animals after ligation of all four vessels have been described by one of us (F. W. Mott). They indicate a deficiency of blood in the brain, its place being taken by regurgitated blood from the venous sinuses and by cerebro-spinal fluid.

(2) SUMMARY OF THE RESULTS OF THE MICROSCOPICAL EXAMINATION OF THE BRAIN IN SURGICAL SHOCK.

Microscopical examination in all these cases of shock revealed (1) many empty collapsed vessels in the substance of the brain, with dilatation of the perivascular spaces and perineuronal spaces, both of which are filled with cerebro-spinal fluid; (2) a variable degree of chromatolysis of the brain cells, most marked and obvious in the autonomic nuclei of the medulla oblongata and less marked in the bulbo-spinal motor nuclei, e.g., the hypoglossal and cervical spinal motor-cells; (3) the smaller pyramidal cells of the cortex are, as a rule, more affected than the large pyramidal and Betz cells; (4) the cells of Purkinje have shown definite chromatolysis and a tendency to take the eosin-acid staining dye in place of the blue basic dye. This confirms the observations of Crile, who noted this change of staining reaction in all forms of shock, whether in human beings or as a result of experimental conditions in animals.

It may be asked, why does this occur with such constancy and intensity in this organ of uniform structure? There are many biological and physiological facts in support of the view that one, and perhaps the most important, function of the cerebellum is that of a large store of neural energy for reinforcing muscular action. The acidophil reaction manifested by these cells was used by Crile as one argument in favour of "acidosis" in the production of shock. In the very remarkable and extensive series of researches which have been carried out under his direction, attention has been directed only to the cerebellum. Other cells of the central nervous system do not show this acidophil reaction. But that "acidosis" is an essential factor cannot be claimed, for intravenous injection of alkaline fluids, e.g., Locke's or Ringer's fluid, does not prevent a fatal termination in cases of shock.

(3) NISSL GRANULES AND NEURAL ENERGY IN RELATION TO SHOCK.

Do we possess methods by which we can ascertain the existence of exhaustion of the neural energy of the ganglion cells and biochemical changes upon which can be established a neuropathological theory of "shock"? Now, although the Nissl bodies are artefacts, yet the amount of this basic chromophil substance may be regarded as an index of the amount of stored energy substance; and to continue this argument we must assume that stimuli arriving at the cell excite the catalytic action of the nucleus and that the stored latent

energy substance is thereby transformed into active energy in the form of stimuli, which are transmitted directly or indirectly to muscles and glands through systems of neurons. Now it is obvious that excessive stimulation, when associated with multifarious depressing conditions, may lead to exhaustion by over-stimulation of this latent store of neuro-potential; and particularly is this likely to occur if there is a fall of blood-pressure accompanied by other contributory factors, especially pain and loss of sleep, during the latter of which neural energy is stored. Crile's experiments show that an exhaustion of this kinetoplasm may occur from absence of sleep.

(4) FAT EMBOLISM IN SURGICAL SHOCK.

Porter examined the brains of a number of cases of surgical shock caused by extensive gunshot wounds and found fat embolism. He came to the conclusion that this might be the cause. We have found fat embolism in three of these cases of gunshot wound with compound comminuted fractures of large bones and much damage and laceration of the soft tissues, but I do not think it was sufficient to cause a fatal termination, although it may have been a contributory factor, seeing that vessels in the medulla contained droplets of fat.

(5) ABSORPTION OF HISTAMINES IN SURGICAL SHOCK.

A more important cause of secondary wound shock is the absorption of histamine or toxic substances from the damaged muscles. The arguments advanced in favour of the absorption of toxins derived from damaged muscles are: (1) A number of these men suffering from pure muscle injury have died of shock. It has been established that microbial infection is not an important factor in these cases. (2) Great improvement may follow rapid amputation of a lacerated limb. (3) Bayliss has shown experimentally that violent damage of the muscles of an animal while under anaesthesia causes shock; but Crile would argue that when you damage a tissue, although that animal may not show any signs of feeling, it is nevertheless receiving nociceptive stimuli, and it is quite conceivable that these nociceptive stimuli reaching the great central station for pain, the optic thalamus, are unconsciously reflected down to the cardiac and respiratory medullary centres. Morphia, carefully administered—and it may be remarked that it is contra-indicated if there is cyanosis—will relieve pain and excitation of the nerve centres and help to prevent shock in severe wounds.

(6) EXPERIMENTS OF DALE ON HISTAMINE SHOCK.

There is experimental evidence that absorption of toxins derived from damaged tissues play an important part in the production of shock; for Dale has shown that injections of histamines produce shock. In one case, after slow infusion occupying an hour, death took place from failure of the vital centres. During that time the cells had used up a certain amount of the basophil staining substance, shown by the comparison of the appearance of the cells of the medulla and the large flask-shaped cells of the cerebellum with similar cells in the brain of an animal which died three minutes after infusion at once of the same amount of histamine. In this case of sudden death there was no time for the cells to use their stored energy substance; consequently they present a normal staining appearance.

The former experiment would represent what actually takes place in wound

shock, viz., a slow poisoning of the vital centres. It may be presumed that in the former there was a slow and progressive fall of the blood-pressure; in the latter there was a gradual fall.

(7) VASCULAR THEORY OF SHOCK: EXÆMIA OF CANNON.

We have not said anything yet about the vascular theory. It was formerly held that in "shock" the blood-pressure fell, owing to its accumulation in the capillaries and veins of the abdominal organs. But it has been found that this is not the case. There is, however, a concentration of the blood and stasis in the capillaries of the body generally, a condition which Cannon calls "exæmia." The plasma exudes through the capillary walls into the tissues; and in proof of this concentration is the fact that the hæmoglobin index is increased, likewise the blood cell count.

TREATMENT OF SHOCK.

Intravenous injection of salines proved useless; in some cases transfusion of citrated blood and gum saline solution, which was introduced on the assumption that it could not escape from the vessels, have raised the blood-pressure and led to recovery; in others, as in the cases in which we have investigated the brains, these measures were unavailing. Crile recommends introduction of fluids by natural methods—e.g., Murphy's drip enema of 5 per cent. glucose and 5 per cent. soda bicarbonate solution. Stimulants seem to be useless, also injection of adrenalin and strychnine.

It seems, therefore, probable that all causes of exhaustion of vital energy predispose to primary and secondary shock. In the case of the wounded in battle, thirst, exposure to cold and wet, delayed evacuation, rough and prolonged transport to hospital, and suffering with acute physical and mental agony conspire together to sap the vital energy, and when in consequence of circulatory failure and toxæmia from damaged tissues, the vital centres of the medulla become refractory and fail to discharge impulses the blood-pressure falls progressively, and eventually, in spite of all remedial measures, the circulation and respiration cease.

In resuscitation from surgical shock practical experience shows that the treatment of the following phenomena have yielded satisfactory results, viz., (a) the fall of blood-pressure; (b) the fall of the body temperature; (c) the lessening of the volume of the blood. Experience shows that cases of hæmorrhage combined with little shock yield the best results.

BIBLIOGRAPHY.

Reports of the Special Investigation Committee on Surgical Shock and Allied Conditions, Medical Research Council. National Health Insurance, Special Report Series, No. 25, No. 26, 1919. CRILE and LOWER. "Surgical Shock," 1920 (W. B. Saunders and Co.). MOTT, Sir FREDERICK, "War Neuroses and Shell Shock," 1919.

Section of Neurology.

President—Mr. PERCY SARGENT, C.M.G., D.S.O., F.R.C.S.

Decerebrate Rigidity in Animals and its Recognition in Man.

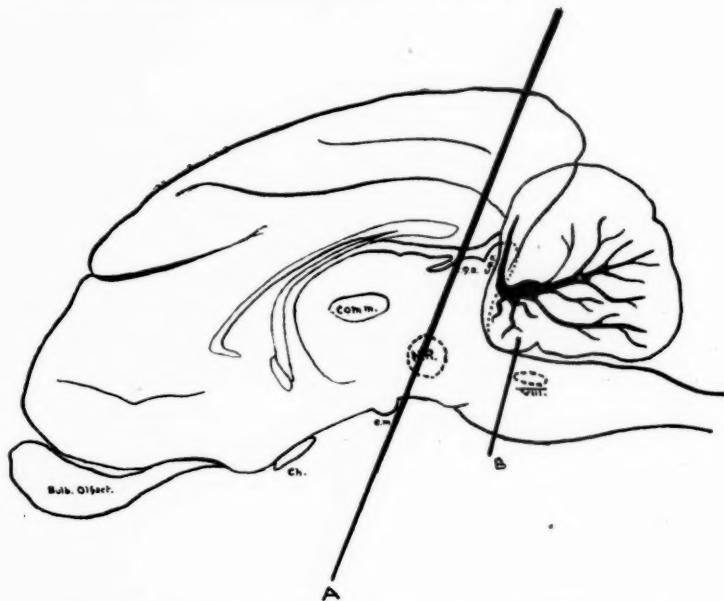
By F. M. R. WALSHE, M.D.

IN our efforts to interpret the symptoms of nervous disease in terms of function, the primary importance to us of the experimental physiology of the nervous system can scarcely be exaggerated. Although, unfortunately, the demands of clinical work rarely allow us the opportunity of studying at first hand the experimental side of neurology, yet the fruits of physiological research lie to our hand, and it seems to me that nowhere in neurology are we more dependent upon the experimental analysis of function than in the case of the motor activities of the nervous system. We can hardly hope to understand the numerous and complex forms of disordered movement seen clinically, without some insight into the normal nervous processes underlying the production and co-ordination of movement. During the past twenty-five years the most remarkable advances have been made by experimental physiologists, and especially by those of our own country, on this aspect of nervous activity, yet clinical neurologists have, for the most part, pursued their researches and evolved their hypotheses without reference to them. However, there are signs that modern physiology is at last coming into its own, and the numerous recent clinical studies of decerebrate rigidity in man afford welcome evidence that despite the ravages worked in our ranks by the sparkling wine of clinical psychology, yet there are still workers interested in the physiology of the nervous system.

The correlation of experimental with clinical observations is not without peculiar difficulties of its own, and the careful study of some recently published clinical descriptions of what purports to be decerebrate rigidity in man appear to me to indicate that considerable uncertainty exists among clinicians as to the anatomical and physiological postulates to be satisfied before a diagnosis in these terms can be established. I propose, therefore, to state briefly the anatomical and physiological factors concerned in the production and maintenance of decerebrate rigidity in the experimental animal. The pioneer observations and the minute physiological analysis of the rigidity we owe to the genius of Sherrington, but during the years 1912-20, a series of twenty-five papers of fundamental importance have come from the laboratory of Professor Magnus of Utrecht, recording beautiful researches which have cleared up many points previously obscure.

(A) ANATOMICAL FACTORS: (i) *Planes of Transection.*—The fact that coronal transection of the brain-stem between the anterior and posterior

colliculi results in the development of decerebrate rigidity was first observed by Sherrington in 1896. He found also that transections as far caudal as the pons had the same result, but that as soon as the plane of section reached the neighbourhood of the calamus scriptorius, the rigidity was abolished and the musculature became flaccid. Magnus has defined the anterior and posterior limits more precisely, and he finds that, in making a series of coronal transections from before backwards and beginning anterior to the thalami, rigidity does not develop until the transection reaches a plane bounded dorsally by the posterior limits of the colliculus and ventrally by the region immediately caudal to the corpora mammillaria. On further coronal transections the rigidity persists undiminished until the plane of entry of the eighth nerves is passed. Caudal to this plane, transection abolishes the rigidity.



Median sagittal section of cat's brain (from Potter and Winkler's Atlas). A, transections cephalad to this transverse plane result in the production of an animal with tone of normal intensity. The animal can walk, jump and stand, and actively take up any posture on appropriate stimulation. B, transections of the brain-stem between the planes A and B result in the production of decerebrate rigidity or "reflex standing." The animal cannot right itself if overturned, walk or run. If any reflex change of posture occurs the animal falls. Transections caudal to the plane B abolish the rigidity and the musculature becomes flaccid.

I have attempted to illustrate these observations by a series of photographs of the brain-stem of a cat and by a diagram of a sagittal section of the cat's brain—taken from Winkler's atlas—in which the anterior and posterior planes are marked.

(ii) *The Cerebellum*.—Sherrington early recorded that extirpation of the cerebellum did not always abolish a decerebrate rigidity previously established.

Later Thiele confirmed this, finding that unless Deiters' nuclei were removed during ablation, the rigidity persisted. In a very large series of observations on the rabbit, cat and dog, Magnus has finally established that the cerebellum is not essential to the maintenance of decerebrate rigidity, which persists undiminished after ablation of the cerebellum and bilateral section of the eighth nerves.

(iii) *Red Nucleus*.—Reference to the diagram indicates a further fact established by Magnus—namely, that the red nucleus plays no part in the maintenance of decerebrate rigidity. Indeed, it seems as though removal of the greater part of the red nucleus is an essential preliminary to the development of rigidity.

It is further apparent that in the more caudal transections, most of the middle peduncles and the pons are removed.

We may therefore conclude that the reflex centres for the maintenance of decerebrate rigidity lie in the pons and medulla, and that the afferent and efferent limbs of the reflex arc do not pass through the cerebellum. In the cord, these paths appear to lie in the ventro-lateral columns, and, as is known, they arise and terminate in the proprioceptive nerve endings of the tonic muscles. The conclusions reached from Magnus' observations have been confirmed by Winkler's careful microscopical study of the brain-stems of the experimental animals used.

(B) We may now pass to some *PHYSIOLOGICAL CONSIDERATIONS*. The decerebrate animal is one from which the whole of the fore-brain and between-brain, and the anterior part, or the whole, of the mid-brain have been removed. Whether or not the cerebellum is intact is immaterial. In these circumstances all the muscles which maintain the animal in its normal standing posture are in strong tonic spasm. These include the limb extensors, the elevators of the head, neck and tail, and the extensors of the spine, making up what Sherrington has called the "anti-gravity" muscles. This decerebrate rigidity is an exaggeration of normal tone, and under the law of reciprocal innervation we accordingly find that the antagonistic flexor group of muscles is correspondingly inhibited and atonic. Such an animal, if carefully placed on its feet, can stand motionless for several hours. It breathes automatically with a normal rhythm and shows numerous pseudo-affective and other reflex reactions. Having no power of temperature regulation it cannot be kept alive for more than a few hours except with great difficulty in an incubator. Bazett, at Oxford, succeeded in keeping such animals alive for several weeks.

But although it can stand when passively erected, such an animal can neither walk, run, nor jump, and if overturned has no power to right itself, but lies passively in the position determined by gravity. It may, indeed, take a single leap, but, unable to maintain its balance, it falls at once. Magnus calls the sum total of the reflexes by which the animal maintains the standing posture "standing reflexes," and he points out that while, as Sherrington has said, decerebrate rigidity is "reflex standing," yet it is a caricature of the normal function, both in respect of the intensity of the spasm and of the attitude adopted. We have to consider, however, not only the mechanisms for the maintenance of decerebrate rigidity, but also those by which it may be regulated. Its maintenance demands the integrity of reflex centres in pons and medulla and of reflex paths between these and the musculature. Its regulation is more complex and is largely the result of afferent impulses arising in the otolith organs of the labyrinths and in the proprioceptive nerve-endings of the neck muscles, that is, of the muscles which support the head on the trunk and

determine the position of the head in space. Changes in the position of the head in space set up labyrinthine reflexes which modify the rigidity, and if, in the new posture, the relation of the head to the trunk is altered, neck reflexes are also set up still further affecting the rigidity. Lack of time prevents my discussing this subject, or describing Magnus' beautiful analyses of the various regulating reflexes.

To understand the nature of decerebrate rigidity fully, it is now necessary to turn to the *thalamus and mid-brain animals*, as studied by Magnus. The former is an animal from which cerebral hemispheres, including corpora striata, have been removed, leaving thalami and brain-stem intact. The mid-brain preparation has, in addition, suffered ablation of the thalami. These two preparations differ in but a single respect, for while the animal with thalami has a normal temperature regulation, the mid-brain animal has completely lost this function. Both animals possess tone of normal intensity; they can sit, stand, walk, run and jump, and if overturned they instantly right themselves. All the motor activities of the living animal are possible, but, since there is no volition, they have to be reflexly elicited. Auditory stimuli will make the animal run and jump. The sum total of the reflexes which make these numerous activities possible persists unimpaired after ablation of the cerebellum. Therefore, the active adoption and maintenance of a variety of postures in conformity with the reflex movements of the preparation, which include movements of the type known as automatic and associated, are possible and are normally carried out by the animal without its fore-brain, without the participation of either cerebellum or corpus striatum. The possession of the mid-brain allows the animal actively—and, of course, reflexly—to regulate the position of its head in space, and it is this capacity which enables it to maintain its equilibrium under all circumstances of movement.

When the reflex mechanisms which make this possible are intact, the animal can keep its head with the right side up to the world, and in so doing sets up secondarily a whole chain of reflexes by which first the neck and then the trunk of the animal is adjusted to the position of the head. The reflex centres concerned have been conclusively shown by Magnus and de Kleijn to lie entirely within the mid-brain, and neither the afferent nor efferent paths pass through the cerebellum.

We are now in a position to formulate the situation of the decerebrate animal. The nervous mechanisms concerned in the postural side of motor co-ordination consist in a reflex arc, which by its activity maintains muscle tone. Tone is the basis, the raw material, of posture. Its adjustment in harmony with the various motor activities of the living animal is subserved by a series of brain-stem centres extending from the anterior part of the mid-brain to the medulla. In the mid-brain animal the whole of this mechanism is intact and all the normal postural activities of the living animal are possible. Decerebration, however, removes the larger and the dominant part of this regulating mechanism with a single exception. Such regulating mechanisms as are left cannot be thrown reflexly into action. Only the simplest form of tonic activity remains in being—reflex standing. This complete and exclusive possession of reflex tone by the standing reflex leads to an intensified tone, decerebrate rigidity, in the muscles which keep the animal erect, and to a corresponding inhibition of tone in the antagonistic flexor group. Therefore, the reflex mechanism for the maintenance of tone is not only released from cortical control, but also from that of the chief subcortical postural centres in the mid-brain.

Three striking features emerge from the study of the experimental animal without a fore-brain: (i) It can carry out perfectly co-ordinated movements without a cerebellum; (ii) the corpus striatum appears to play no essential part in the performance of what have been called automatic and associated movements or in the regulation of muscle tone; (iii) to produce decerebrate rigidity it is necessary not only to remove the fore-brain, but also the anterior part of the mid-brain.

Here also, we must remember Sherrington's early observation that different forms of extensor spasm follow mutilation of the nervous system in this region, of which decerebrate rigidity is but one form.

I am unable here to deal fully with the physiological qualities of decerebrate rigidity. They have been fully described by Sherrington in a résumé in *Brain* in 1915.¹ The rigidity is extensor tone intensified and thrown into relief by the correspondingly intense inhibition of the antagonistic flexor group. In a limb, the proximal muscles are more rigid than the distal, which are scarcely affected, while the fore-limbs are more rigid than the hind-limbs.

What Sherrington has called the "plasticity" of the rigidity is the result of two reflex reactions, the "shortening" and "lengthening" reactions, by which the muscle tends to retain a new length imposed upon it, either passively or the result of active contraction or inhibition. Thus the tonic prolongation of the knee-jerk in spastic conditions is a familiar example of the "shortening" reaction. In addition the rigidity is readily inhibited, or temporarily overset, by phasic reflexes of spinal origin. Such phasic reflexes are the flexion, crossed extension and extensor thrust reflexes of the hind limb. These reactions break through the tonic posture of the animal, which, however, is restored by a compensatory rebound reaction as soon as the movement is completed.

This completes what I realize to have been a very summary account of a vast amount of experimental research, which is of fundamental importance to us in the consideration of every form of motor disorder of central origin. How are we to apply all this to our clinical work? In a case of tonic extensor rigidity in man, what criteria are we to demand as essential to a diagnosis of decerebrate rigidity? *On the anatomical side*, clearly, the complete experimental lesion can never be even approximately reproduced. But the essentials are theoretically quite possible, namely, impairment or abolition of voluntary motor control, and interference with the function of the tonic reflex centres in the mid-brain. Obviously a mid-brain lesion is most likely to produce this combination of results, but we may not assume that a lesion situated higher still in the fore-brain, may not interfere with the activity of mid-brain centres without their being directly involved in a focal lesion. In the case of spinal lesions, the anatomical difficulties are even greater, unless we suppose that other efferent and descending paths than the pyramids are affected. I cannot discuss this point fully here, but there is, in my opinion, no insuperable difficulty in believing that a spinal lesion may give rise to decerebrate rigidity of the lower limbs in man.

On the physiological side, the rigidity must not only be such as to fix limbs and trunk in extension, but it must also have the characteristic qualities of experimentally produced decerebrate rigidity. This is an aspect of the question somewhat neglected by those who have described so-called decerebrate rigidity in man.

¹ *Brain*, 1915, xxviii, pp. 191-234.

As far as I can gather from the clinical literature of this subject, decerebrate rigidity as a clinical diagnosis has been made in cases belonging to three groups:—

(1) *Cases of spastic paralysis* of so-called pyramidal type, that is hemiplegia and the extended form of spastic paraplegia. Here the chief reason and justification for the diagnosis is the fact that the rigidity in every way is identical with that seen in animals. I have lately enjoyed considerable opportunity of making direct comparison, and I believe that the conditions are identical in nature. That there are sometimes difficulties on the anatomical side I am aware, but I regard them as matter for future elucidation rather than as insuperable arguments against the identification.

(2) *Cases of tonic extensor spasm*, with coma and with or without tonic fits, and associated with lesions in the mid-brain region, most typically hæmorrhages into the ventricular system of the brain. I believe that in very few of these are we dealing with decerebrate rigidity. What appears to have led clinical observers to the conclusion is the posture of the patient—in fact one writer appears to use the phrases “decerebrate rigidity” and “decerebrate posture” as synonymous terms. The head is retracted, the spine in opisthotonus, with the limbs rigidly extended and adducted. This picture has long been familiar to clinicians as occurring in tetanus and strychnine poisoning, and it is clearly not peculiar to decerebrate rigidity. The nature of the spasm in tetanus and strychnine poisoning is fundamentally different from true decerebrate rigidity, as is taught in every text-book of physiology. Therefore, diagnosis by posture is insufficient and fallacious. Further, though cases of this kind do indeed show signs of mid-brain involvement, yet the lesion does not end here, and in almost all of them there is clear evidence of a progressive and ultimately fatal interference with the functions of the vital medullary centres.

The clinical picture of hæmorrhage into the ventricles is familiar. Not only may there be extreme extensor rigidity with head retraction and opisthotonus, but in addition there may be sudden exacerbations of the rigidity, the so-called tonic fits, and also, and even more significantly, there is a rising temperature and gross alterations in cardiac and respiratory rhythm. Now none of these things occur on experimental decerebration unless there is a reflux of blood round the medulla leading to compression, that is to interference with the blood-supply of the medullary centres. Therefore the fits and the respiratory and cardiac phenomena are early signs of commencing failure of blood-supply in the medullary centres. They are the manifestations of that hyperexcitability of nervous centres which is the initial reaction to oxygen deprivation. They are not simple release symptoms. Their variability and their speedy replacement by paralysis of all nervous activity and death indicate this clearly, as do also the circumstances of their occurrence under experimental conditions. It is quite probable that among the centres stimulated in this way those which are normally responsible for the maintenance of muscle tone may be included, but even so we are hardly justified in speaking of the resulting spasm as strictly comparable with the reflex decerebrate rigidity of animals. It seems best therefore to reserve the term decerebrate rigidity, in cases of this group, for those instances in which there are no signs of medullary involvement or of tonic fits and in which the spasm shows a certain degree of stability and duration. We must also remember that there is more than one kind of extensor rigidity seen after mutilation of the nervous system in this region, and further, that not even the presence of the labyrinthine

thine and neck reflexes of Magnus affords an infallible indication that decerebrate rigidity is present; for this is not essential to their appearance.

(3) This group consists of cases of so-called fragmentary decerebrate rigidity or posture. It includes cases of functional and organic disease, in neither of which is there any question of abolition of fore-brain or mid-brain activity. In fact the cases seem to have no common factor either anatomical or physiological. In some there is described widespread rigidity, in others rigidity of a single segment of a limb. There may be no rigidity, but just that posture of a limb or limb segment which has been remarked in less equivocal cases of decerebrate rigidity belonging to Group 2. I cannot see any justification for the use of the term in connexion with this heterogeneous group, and to continue so to employ it renders it quite meaningless. This would be unfortunate, for if we adopt a term of precision from experimental physiology, we should be careful to use it precisely.

Decerebrate Rigidity in Animals and Spasticity in Man.

By GEORGE RIDDOCH, M.D.

THE application of the results of physiological experiments on animals to the elucidation of disordered functions in man has for many years proved of the greatest value. In neurology, especially, this line of investigation has borne abundant fruit and to it we are largely indebted for our present knowledge, imperfect though it is, of the physiological and anatomical basis of spasticity. The series of papers published by Sherrington and his followers since 1897, on decerebrate rigidity has stimulated neurologists, particularly in this country, to re-examine hypertonic phenomena in the light of their researches. As yet only the fringe of the problems presented has been touched but the results are most encouraging for further exploration.

It is well recognized by clinicians that muscular rigidity may appear in more than one form after disease or injury of the central nervous system. Thus, even to the crude tests employed at the bedside, spasticity in hemiplegia differs in important respects from rigidity in paralysis agitans and from the flexor spasticity of the lower limbs in certain cases of gross lesion of the spinal cord. So also in animals it is probable, as Sherrington believes, that other varieties of rigidity than that which follows mid-brain transection can be experimentally produced by lesions of the neuraxis. As it happens, however, investigations in the laboratory have been hitherto mainly concerned with the experimental rigidity that is unfortunately termed "decerebrate."

The main questions therefore to be raised are the following:—

(1) Is spasticity in any of the forms in which it appears in disorders of the central nervous system in man comparable to the mammalian decerebrate rigidity described by Sherrington? and

(2) If so, what is its physiological and anatomical basis?

In order to be able to assert that spasticity is identical with decerebrate rigidity it is necessary to show that they both respond to tests in the same way. To decerebrate rigidity Sherrington has ascribed certain properties most of which can be looked for at the bedside in cases of spasticity. These are: (1) the distribution of rigidity mainly to the extensor muscles and the resulting attitude of the body at rest; (2) the "lengthening" and "shortening"

reactions; (3) the ease with which it can be temporarily inhibited in a limb by stimulation of reflex movements; and (4) absence of fatigue over long periods in the rigid muscles.

So far as clinical investigations have gone these distinctive qualities of decerebrate rigidity have been satisfactorily demonstrated in the spasticity of only three groups of motor disorders in man: (1) *Hemiplegia* resulting from lesions in the region of the internal capsule; (2) *quadriplegia* with extensor rigidity of the trunk and lower limbs and extensor or flexor rigidity of the upper limbs due to high cervical lesions of the spinal cord; and (3) *paraplegia* with extensor rigidity of the lower limbs following spinal lesions. It is probable that more complete examination than has up to the present been carried out will show that certain examples of generalized extensor rigidity, associated with lesions in the neighbourhood of the mid-brain, may be found to form a fourth group. In a paper entitled "Decerebrate Rigidity in Man,"¹ Kinnier Wilson has drawn attention to cases of this kind. But since his observations were confined to the posture of the body and limbs, the evidence upon which he based his conclusion is incomplete.

Sherrington gives the following description of the posture of a monkey after the mid-brain has been cut across behind the anterior colliculi. When the animal is suspended from a cradle with its limbs hanging down its head is elevated with the chin tilted forwards. There is slight opisthotonus of the spine in the lumbo-sacral region and the tail is curved upwards. The fore-limbs are retracted at the shoulder-joints, straightened at the elbows and somewhat flexed at the wrists; the limbs are so rotated that the palms face outwards. Sometimes one or both upper limbs are flexed at the elbows. The hind-limbs are similarly retracted, strongly extended at the knees and to a less extent at the ankles. This attitude of generalized extension is due to tonic rigidity of the extensor muscles, their antagonists, the flexors, being mildly relaxed. The fore-limbs are more rigid than the hind-limbs and the proximal than the peripheral joints; the muscles of the fingers and toes are flaccid.

The main features of this posture and the distribution of the rigidity in the trunks and limbs were strikingly reproduced in three patients investigated by Dr. Buzzard and myself. They were examples of quadriplegia resulting from high cervical lesions of the spinal cord and the complete result of our investigations upon them are described in a paper which appears in the current number of *Brain*.² In all three the trunk and four limbs were paretic, sensibility, especially postural, was gravely disturbed, the tendon-jerks were much increased, reflex movements could readily be evoked in the upper and lower limbs and the abnormal form of toe response was obtained on both sides: voluntary control over the bladder and the rectum was impaired.

The trunk and limbs were rigid in extension. The upper limbs were stiffly held in a position of adduction and internal rotation at the shoulders, extension and pronation at the elbows, and flexion at the wrists. Palpation of the muscles and passive movements of the joints showed that except in the hands spasticity was general but unequally developed in opposing muscle-groups. It greatly preponderated in those muscles which, by their action, determined the resting attitude at the different joints.

There appeared to be a definite relationship between the degree of spasticity in any group of muscles and that in the corresponding antagonists; for the

¹ *Brain*, 1920, xliii, p. 220.

² *Brain*, 1921, xliv, pp. 397-499.

greater the rigidity of the one the more relaxed was the other. For example, certain muscles, such as the pectorals, were always found to be in strong tonic contraction, and in contrast their opponents were almost flabby. On the other hand, triceps was rarely so rigid as the muscles of the anterior axillary wall and biceps usually stood out well and was of firmer consistence than deltoid.

In the hands only the adductors of the thumbs were spastic. The extreme mobility of the fingers recalls Sherrington's description of the lack of tone in the digital muscles of the decerebrate monkey.

Extension of the elbows from tricipital rigidity is the usual attitude at these joints in the laboratory preparation; but it is not invariable. Sometimes the rigidity shifts from the extensor to the flexor and the fore-limb rests in a position of flexion. The same phenomenon was sometimes observed in one of our quadriplegic patients. With the body at rest the upper limbs usually lay extended at the elbows with rigidity of the extensor and relative relaxation of the flexors. Not infrequently, however, the opposite position of flexion was encountered, and on these occasions the flexors were more spastic than the extensors. It was found that if the elbow was passively flexed and held in this position for a short time, shifting of the rigidity from the extensors to flexors often took place.

Predominant spasticity of the flexors at the elbow with a resting attitude of flexion was invariable in two other examples of quadriplegia due to lesions of the spinal cord above the cervical enlargement. The disturbance of function, as regards motion, sensation and vesical control, was altogether less than in the cases showing tricipital rigidity, and the degree of spasticity was not so great. But apart from the posture at the elbows the attitude of the rest of the body and the distribution of the rigidity was the same.

The well-known posture of the upper and lower limbs in hemiplegia, and of the lower limbs in paraplegia with extensor rigidity, are similarly the result of preponderance of tonus in certain muscle-groups with relative relaxation of their antagonists.

It may therefore be said that so far as the distribution of spasticity is concerned certain forms of quadriplegia, hemiplegia and paraplegia closely resemble the decerebrate ape. This similarity, however, is insufficient by itself to establish the physiological identity of these states of muscular rigidity. To do so other evidence is necessary. How fallacious the proof derived from posture alone may be is apparent when some of the material that has recently been brought forward as supplying instances of decerebrate rigidity in man is critically analysed. Although in strychnine, tetanus and some hysterical seizures the trunk is arched backwards and the lower limbs extended, all the muscles affected are in powerful tonic contraction. Again, pronation of the forearms and flexion of the hands are striking attitudes of these parts in the decerebrate preparation as well as in hemiplegia and quadriplegia in man. But they are usual also in chorea and are then associated with diminished muscular tone.

It is, therefore, obvious that in correlating disorders of tone in man with decerebrate phenomena in animals posture is only of value when taken in conjunction with the results of other tests.

Perhaps the most distinctive properties of tonic muscles in decerebrate animal preparations are the "lengthening" and "shortening" reactions. They can be demonstrated in the following way: With the animal lying on its side the observer elevates the hind-limb into the vertical position and the knee remains extended from tonic contraction of vasto-crureus. If he now passively

bends the knee so as to lengthen the extensor, the leg will be held in its new position by the muscles against the action of gravity. This is the "lengthening" reaction. When the attachments of vasto-crureus are approximated by passively extending the knee, the "shortening" reaction is evoked, the leg being retained by the steady contraction of the extensor in the position into which it has been placed. Decerebrate rigidity thus possesses a quality of plasticity and is postural in function. It is limited to one of the opposing muscle-groups acting on each joint and usually to the extensor.

These reactions can be obtained from the muscles showing predominant spasticity in hemiplegia, quadriplegia and paraplegia with extensor rigidity of the lower limbs. Thus when the lower limb is suddenly lifted from the bed by the thigh the leg is, for a time, held in a position of extension against its own weight by the reflex contraction of vasto-crureus. Moreover, the knee may be passively bent so as to lengthen the extensor, and the new position of the leg is again maintained for a considerable time. In the same way "lengthening" and "shortening" reactions can be demonstrated in triceps or biceps when they are the seat of rigidity.

An experiment with the knee-jerk brings out the "shortening" reaction in another way. When the limb is rotated outwards at the hip and flexed at the knee and a series of taps are made on the patellar tendon, step-like extension of the leg results. During each jerk rigidity in the extensor muscle is inhibited, but immediately on completion of the movement it becomes re-established and the leg is held in the new position of extension by the same degree of tonic contraction as before, in spite of the shortening of the extensor.

This observation demonstrates that static tone in the extensor of the knee is independent of the muscle length and the same phenomenon is found in the rigid muscle at the elbow in quadriplegia and hemiplegia.

Just as in the decerebrate animal, however, the opponents of the rigid muscles at the knee or elbow fail to show "lengthening" and "shortening" reactions. Compared with their rigid antagonists they are relatively relaxed but they are certainly in stronger contraction than the corresponding muscles of a healthy individual. Still they are unable by their tonic action to support the weight of the segment of the limb peripherally to the joints upon which they act. Thus, when the patient is lying on his face and his leg is held by the observer in a position of flexion at the knee, as soon as it is released it falls to the bed.

Common to the rigidity of the decerebrate animal, and to spasticity in the disorders we are considering, is the ease with which the tonic contraction can be temporarily inhibited by excitation of reflex movements. Thus the rigid extensors are reciprocally relaxed during reflex flexion of the hind or lower limb and similar inhibition of the rigidity occurs when the flexion reflex of the fore or upper limb is evoked by harmful stimulation of the paw of the decerebrate animal or of the hand in quadriplegia in extension. In this class of withdrawal reflexes inhibition of the extensors lasts only for the duration of the flexor movement. Immediately the flexor muscles begin to relax inhibition of the extensors is replaced by excitation, so that the limb is actively thrust out and finally extensor rigidity is re-established.

These reactions, in which static rigidity is primarily inhibited, are thus biphasic, the second movement, which is opposite in effect to the first, bringing back the limb to its original position at rest.

Inhibition of static rigidity in flexors or extensors of a limb also occurs during the performance of a movement which is carried out by these muscles

themselves. In this case, however, the immediate sequence of the movement is recovery of the rigidity, and the new position into which the limb has been placed is for a time maintained. Examples of such reactions are the extension reflexes of the upper and lower limbs in quadriplegia and the flexion reflex of the upper limb in hemiplegia.

Finally, the persistence of spasticity is evidence that this form of tonic contraction, like experimental decerebrate rigidity, is not subject to fatigue.

The facts I have placed before you show that the hypertonus of the decerebrate mammalian preparation, and the spasticity of hemiplegia and of the quadriplegia and paraplegia in extension, respond to tests in the same way and hence may be justifiably considered to be closely related phenomena.

In regard to the physiological and anatomical basis of this form of rigidity in man knowledge derived from direct investigation is at present very limited. But the extensive researches carried out by physiologists on higher mammals, the results of which have been summarized by Dr. Walshe, are of course extremely valuable in this connexion.

It is now generally recognized that spasticity is a "release" phenomenon, and, in the disorders we have been considering, it occurs in association with stationary lesions at different anatomical levels of the central nervous system.

It is reflex in origin, being abolished in a limb the posterior roots of which have been divided, and since it is excited and maintained by mechanical muscular tension the reflexes upon which it depends are proprioceptive.

The proprioceptive reflex arcs are not spinal alone, for extensor rigidity fails to develop, as a persistent phenomenon, after complete spinal transection, although flexion and extension reflexes may return. It is true that in some cases of long duration hypertonus of the extensor muscles may be observed, but it is transitory and uncertain in development. In spinal man flexion is the usual attitude of the lower limbs at rest.

Extensor rigidity in man, as in the cat, dog and monkey, is therefore mainly dependent upon the functional integrity of connexions between spinal reflex arcs and headward centres. Animal experiments indicate that these centres lie in the pons and medulla; and one, which seems to be of prime importance, is Deiters' vestibular nucleus.

From the scarcity of accurate histological data in man identification of the afferent and efferent limbs of the prespinal reflex arcs is still mainly in the realm of speculation.

So far as we know at present extensor rigidity may appear after a lesion of either the spinal cord or of the internal capsule and neighbouring structures. The cortico-spinal tract is always injured but in addition the lesion must involve one or more extra-pyramidal descending tracts.

That spasticity does not follow damage to the pyramidal tract alone is shown by the fact that paralysis due to a lesion in the precentral region of the cerebral cortex is not usually associated with much increase of tone in the affected muscles. The occurrence of spasticity in hemiplegia is most certain with lesions of the internal capsule.

Unilateral rigidity with paralysis in animals, resulting from unilateral coronal section of the opposite cerebral hemisphere in a plane which passes through the posterior part of the optic thalamus, has been recorded by Thiele. But until his observations have been confirmed too much stress should not be laid upon them in relation to spasticity in hemiplegia in man.

In regard to the descending extra-pyramidal paths concerned with the maintenance of spasticity exact information is meagre. That the rubro-spinal

tract plays no essential part is suggested by the following considerations: (1) In hemiplegia of capsular origin this tract and its nucleus are intact; (2) its fibres are so closely situated to, and even intermingled with, those of the crossed pyramidal tract that a lesion of the latter must almost inevitably involve both. And extensor rigidity of the lower limbs may be prominent in the presence of severe paralysis; (3) experimental rigidity of the extensors in animals appears only, or becomes most highly developed, when the mid-brain is transected behind the red nuclei.

Recently one of the quadriplegic patients already mentioned came to autopsy and the situation of the spinal lesion points to the probability of the descending limb of the pre-spinal reflex arc lying in the ventral column of the cord. The lesion which to the naked eye has the appearance of gelatinous gliosis, lies in the fourth and fifth cervical segments. It occupies the posterior columns and passes forward from the region of the posterior roots into the lateral columns. The ventral portion of the cord is relatively little affected. Histological examination of the specimen has yet to be carried out.

